

IR2136/IR21362/ IR21363/IR21365 (J&S)

Features

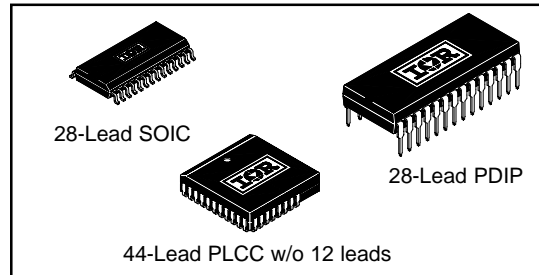
- Floating channel designed for bootstrap operation
Fully operational to +600V
Tolerant to negative transient voltage
dV/dt immune
- Gate drive supply range from 10 to 20V (IR2136),
11.5 to 20V (IR21362) or 12 to 20V (IR21363/IR21365)
- Undervoltage lockout for all channels
- Over-current shutdown turns off all six drivers
- Independent 3 half-bridge drivers
- Matched propagation delay for all channels
- Lowside outputs out of phase with inputs. High
side outputs out of phase (IR2136/IR21363/IR21365)
or in phase (IR21362) with inputs.
- Cross-conduction prevention logic
- 3.3V logic compatible
- Lower di/dt gate driver for better noise immunity
- Externally programmable delay for automatic fault clear

Description

The IR2136/IR21362/IR21363/IR21365(J&S) are high voltage, high speed power MOSFET and IGBT drivers with three independent high and low side referenced output channels for 3-phase applications. Proprietary HVIC technology enables ruggedized monolithic construction. Logic inputs are compatible with CMOS or LSTTL outputs, down to 3.3V logic. A current trip function which terminates all six outputs can be derived from an external current sense resistor. An enable function is available to terminate all six outputs simultaneously. An open-drain FAULT signal is provided to indicate that an overcurrent or undervoltage shutdown has occurred. Overcurrent fault conditions are cleared automatically after a delay programmed externally via an RC network connected to the

3-PHASE BRIDGE DRIVER

Packages

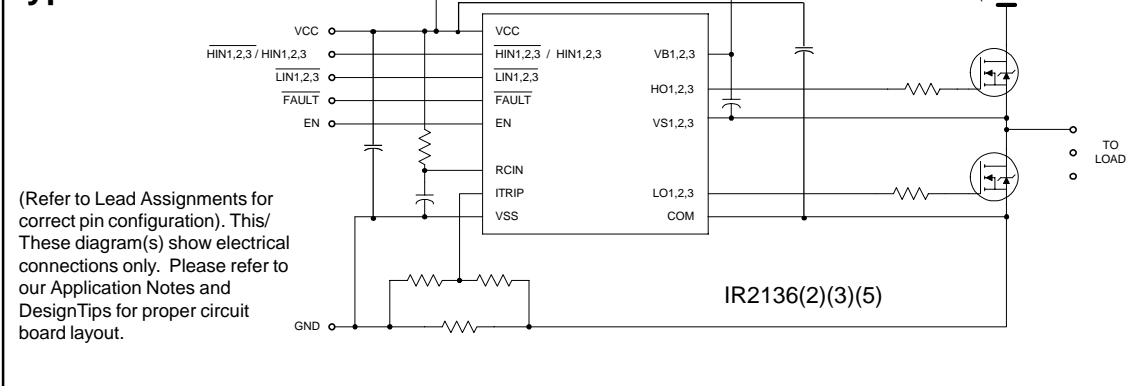


Feature Comparison 2136/21362/21363/21365

Part	Input logic	Under voltage Lockout (VCC, VBS)	Itrip Threshold
2136	$\overline{\text{HIN}}/\overline{\text{LIN}}$	10V	0.46V
21362	HIN/LIN	11.5V	0.46V
21363	$\overline{\text{HIN}}/\overline{\text{LIN}}$	12V	0.46V
21365	$\overline{\text{HIN}}/\overline{\text{LIN}}$	12V	4.30V

RCIN input. The output drivers feature a high pulse current buffer stage designed for minimum driver cross-conduction. Propagation delays are matched to simplify use in high frequency applications. The floating channel can be used to drive N-channel power MOSFETs or IGBTs in the high side configuration which operates up to 600 volts.

Typical Connection



Absolute Maximum Ratings

Absolute maximum ratings indicate sustained limits beyond which damage to the device may occur. All voltage parameters are absolute voltages referenced to COM. The thermal resistance and power dissipation ratings are measured under board mounted and still air conditions.

Symbol	Definition	Min.	Max.	Units	
V _S	High side offset voltage	V _{B1,2,3} - 25	V _{B1,2,3} + 0.3	V	
V _{BS}	High side floating supply voltage	-0.3	625		
V _{HO}	High side floating output voltage	V _{S1,2,3} - 0.3	V _{B1,2,3} + 0.3		
V _{CC}	Low side and logic fixed supply voltage	-0.3	25		
V _{SS}	Logic ground	V _{CC} - 25	V _{CC} + 0.3		
V _{LO1,2,3}	Low side output voltage	-0.3	V _{CC} + 0.3		
V _{IN}	Input voltage LIN,HIN,ITRIP, EN, RCIN	V _{SS} - 0.3	lower of (V _{SS} + 15) or (V _{CC} + 0.3)		
V _{FLT}	FAULT output voltage	V _{SS} - 0.3	V _{CC} + 0.3		
dV/dt	Allowable offset voltage slew rate	—	50		
P _D	Package power dissipation @ T _A ≤ +25°C	(28 lead PDIP)	—	1.5	W
		(28 lead SOIC)	—	1.6	
		(44leadPLCC)	—	2.0	
R _{thJA}	Thermal resistance, junction to ambient	(28 lead PDIP)	—	83	°C/W
		(28 lead SOIC)	—	78	
		(44 lead PLCC)	—	63	
T _J	Junction temperature	—	150	°C	
T _S	Storage temperature	-55	150		
T _L	Lead temperature (soldering, 10 seconds)	—	300		

Recommended Operating Conditions

The Input/Output logic timing diagram is shown in figure 1. For proper operation the device should be used within the recommended conditions. All voltage parameters are absolute referenced to COM. The V_S offset rating is tested with all supplies biased at 15V differential.

Symbol	Definition	Min.	Max.	Units	
V _{B1,2,3}	High side floating supply voltage	IR2136	V _{S1,2,3} +10	V _{S1,2,3} +20	V
		IR21362	V _{S1,2,3} +11.5	V _{S1,2,3} +20	
		IR21363/IR21365	V _{S1,2,3} +12	V _{S1,2,3} +20	
V _{S1,2,3}	High side floating supply offset voltage	Note 1	600		
V _{HO1,2,3}	High side output voltage	V _{S1,2,3}	V _{B1,2,3}		
V _{LO1,2,3}	Low side output voltage	0	V _{CC}		
V _{CC}	Low side and logic fixed supply voltage	IR2136	10	20	
		IR21362	11.5	20	
		IR21363/IR21365	12	20	
V _{SS}	Logic ground	-5	5		
V _{FLT}	FAULT output voltage	V _{SS}	V _{CC}		
V _{RCIN}	RCIN input voltage	V _{SS}	V _{CC}		

Note 1: Logic operational for V_S of COM -5V to COM +600V. Logic state held for V_S of COM -5V to COM -V_{BS}. (Please refer to the Design Tip DT97-3 for more details).

Note 2: All input pins and the ITRIP pin are internally clamped with a 5.2V zener diode.

Recommended Operating Conditions

The Input/Output logic timing diagram is shown in figure 1. For proper operation the device should be used within the recommended conditions. All voltage parameters are absolute referenced to COM. The V_S offset rating is tested with all supplies biased at 15V differential.

Symbol	Definition	Min.	Max.	Units
V_{ITRIP}	ITRIP input voltage	V_{SS}	$V_{SS} + 5$	V
V_{IN}	Logic input voltage \overline{LIN} , HIN (IR2136), HIN(IR21362), EN	V_{SS}	$V_{SS} + 5$	
T_A	Ambient temperature	-40	125	°C

Note 2: All input pins and the ITRIP pin are internally clamped with a 5.2V zener diode.

Static Electrical Characteristics

V_{BIAS} (V_{CC} , $V_{BS1,2,3}$) = 15V unless otherwise specified. The V_{IN} , V_{TH} and I_{IN} parameters are referenced to V_{SS} and are applicable to all six channels ($H_{S1,2,3}$ and $L_{S1,2,3}$). The V_O and I_O parameters are referenced to COM and $V_{S1,2,3}$ and are applicable to the respective output leads: $H_{O1,2,3}$ and $L_{O1,2,3}$.

Symbol	Definition	Min.	Typ.	Max.	Units	Test Conditions	
V_{IH}	Logic "0" input voltage $\overline{LIN1,2,3}$, HIN1,2,3 Logic "1" input voltage HIN1,2,3	3	—	—	V		
V_{IL}	Logic "1" input voltage $\overline{LIN1,2,3}$, HIN1,2,3 Logic "0" input voltage HIN1,2,3	—	—	0.8			
$V_{EN,TH+}$	EN positive going threshold	—	—	3			
$V_{EN,TH-}$	EN negative going threshold	0.8	—	—			
$V_{IT,TH+}$	ITRIP positive going threshold	IR21361/IR21362/IR21363	0.37	0.46		0.55	
		IR21365	3.85	4.30		4.75	
$V_{IT,HYS}$	ITRIP input hysteresis	IR21361/IR21362/IR21363	—	0.07		—	
		IR21365	—	.15		—	
$V_{RCIN,TH+}$	RCIN positive going threshold	—	8	—			
$V_{RCIN,HYS}$	RCIN input hysteresis	—	3	—			
V_{OH}	High level output voltage, $V_{BIAS} - V_O$	—	0.9	1.4			$I_O = 20 \text{ mA}$
V_{OL}	Low level output voltage, V_O	—	0.4	0.6			$I_O = 20 \text{ mA}$
V_{CCUV+} V_{BSUV+}	V_{CC} and V_{BS} supply undervoltage positive going threshold	IR2136	8.0	8.9		9.8	
		IR21362	9.6	10.4	11.2		
		IR21363/IR21365	10.6	11.1	11.6		
V_{CCUV-} V_{BSUV-}	V_{CC} and V_{BS} supply undervoltage negative going threshold	IR2136	7.4	8.2	9.0		
		IR21362	8.6	9.4	10.2		
		IR21363/IR21365	10.4	10.9	11.4		
V_{CCUVH} V_{BSUVH}	V_{CC} and V_{BS} supply undervoltage lockout hysteresis	IR2136	0.3	0.7	—	μA	
		IR21362	0.5	1.0	—		
		IR21363/IR21365	—	0.2	—		
I_{LK}	Offset supply leakage current	—	—	50			$V_{B1,2,3} = V_{S1,2,3} = 600\text{V}$
I_{QBS}	Quiescent V_{BS} supply current	—	70	120			$V_{IN} = 0\text{V}$ or 5V
I_{QCC}	Quiescent V_{CC} supply current	—	1.6	2.3	mA		
$V_{IN, CLAMP}$	Input clamp voltage (HIN, LIN, ITRIP and EN)	4.9	5.2	5.5	V		$I_{IN} = 100\mu\text{A}$
I_{LIN+}	Input bias current (LOUT = HI)	—	200	300	μA		$V_{LIN} = 0\text{V}$

IR2136/IR21362/IR21363/IR21365(J&S)

International
IR Rectifier

Static Electrical Characteristics cont.

V_{BIAS} (V_{CC} , $V_{BS1,2,3}$) = 15V unless otherwise specified. The V_{IN} , V_{TH} and I_{IN} parameters are referenced to V_{SS} and are applicable to all six channels ($H_{S1,2,3}$ and $L_{S1,2,3}$). The V_O and I_O parameters are referenced to COM and $V_{S1,2,3}$ and are applicable to the respective output leads: $H_{O1,2,3}$ and $L_{O1,2,3}$.

Symbol	Definition	Min.	Typ.	Max.	Units	Test Conditions
I_{LIN-}	Input bias current (LOUT = LO)	—	100	220	μA	$V_{LIN} = 5V$
I_{HIN+}	Input bias current (HOOUT = HI)	IR2136(3)(5) —	200	300		$V_{HIN} = 0V$
		IR21362 —	30	100		$V_{HIN} = 5V$
I_{HIN-}	Input bias current (HOOUT = LO)	IR2136(3)(5) —	100	220		$V_{HIN} = 5V$
		IR21362 —	0	1		$V_{HIN} = 0V$
I_{ITRIP+}	“high” ITRIP input bias current	—	30	100		$V_{ITRIP} = 5V$
I_{ITRIP-}	“low” ITRIP input bias current	—	0	1		$V_{ITRIP} = 0V$
I_{EN+}	“high” ENABLE input bias current	—	30	100		$V_{ENABLE} = 5V$
I_{EN-}	“low” ENABLE input bias current	—	0	1		$V_{ENABLE} = 0V$
I_{RCIN}	RCIN input bias current	—	0	1		$V_{RCIN} = 0V$ or $15V$
I_{O+}	Output high short circuit pulsed current	120	200	—	mA	$V_O = 0V$, $PW \leq 10 \mu s$
I_{O-}	Output low short circuit pulsed current	250	350	—		$V_O = 15V$, $PW \leq 10 \mu s$
$R_{ON,RCIN}$	RCIN low on resistance	—	50	100	Ω	
$R_{ON,FLT}$	FAULT low on resistance	—	50	100		

Dynamic Electrical Characteristics

$V_{CC} = V_{BS} = V_{BIAS} = 15V$, $V_{S1,2,3} = V_{SS} = COM$, $T_A = 25^\circ C$ and $C_L = 1000 pF$ unless otherwise specified.

Symbol	Definition	Min.	Typ.	Max.	Units	Test Conditions
t_{on}	Turn-on propagation delay	300	420	550	nS	$V_{IN} = 0 \text{ \& } 5V$ $V_{S1,2,3} = 0$ to $600V$
t_{off}	Turn-off propagation delay	250	400	550		
t_r	Turn-on rise time	—	125	190		
t_f	Turn-off fall time	—	50	75		
t_{EN}	ENABLE low to output shutdown propagation delay	300	450	600		$V_{IN}, V_{EN} = 0V$ or $5V$
t_{ITRIP}	ITRIP to output shutdown propagation delay	500	750	1000		$V_{ITRIP} = 5V$
t_{bl}	ITRIP blanking time	100	150	—		$V_{IN} = 0V$ or $5V$ $V_{ITRIP} = 5V$
t_{FLT}	ITRIP to FAULT propagation delay	400	600	800		$V_{IN} = 0V$ or $5V$ $V_{ITRIP} = 5V$
t_{FILIN}	Input filter time (HIN, LIN, EN)	100	200	—		$V_{IN} = 0 \text{ \& } 5V$
t_{FLTCLR}	FAULT clear time RCIN: R=2meg, C=1nF	1.3	1.65	2		mS
DT	Deadtime	220	290	360	nS	$V_{IN} = 0 \text{ \& } 5V$ External dead time >400nsec
MT	Matching delay ON and OFF	—	40	75		
MDT	Matching delay, max (t_{on}, t_{off}) - min (t_{on}, t_{off}), (t_{on}, t_{off} are applicable to all 3 channels)	—	25	70		
PM	Output pulse width matching, $PW_{in} - PW_{out}$ (fig.2)	—	40	75		

NOTE: For high side PWM, HIN pulse width must be $\geq 1 \mu sec$

IR2136/IR21362/IR21363/IR21365(J&S)

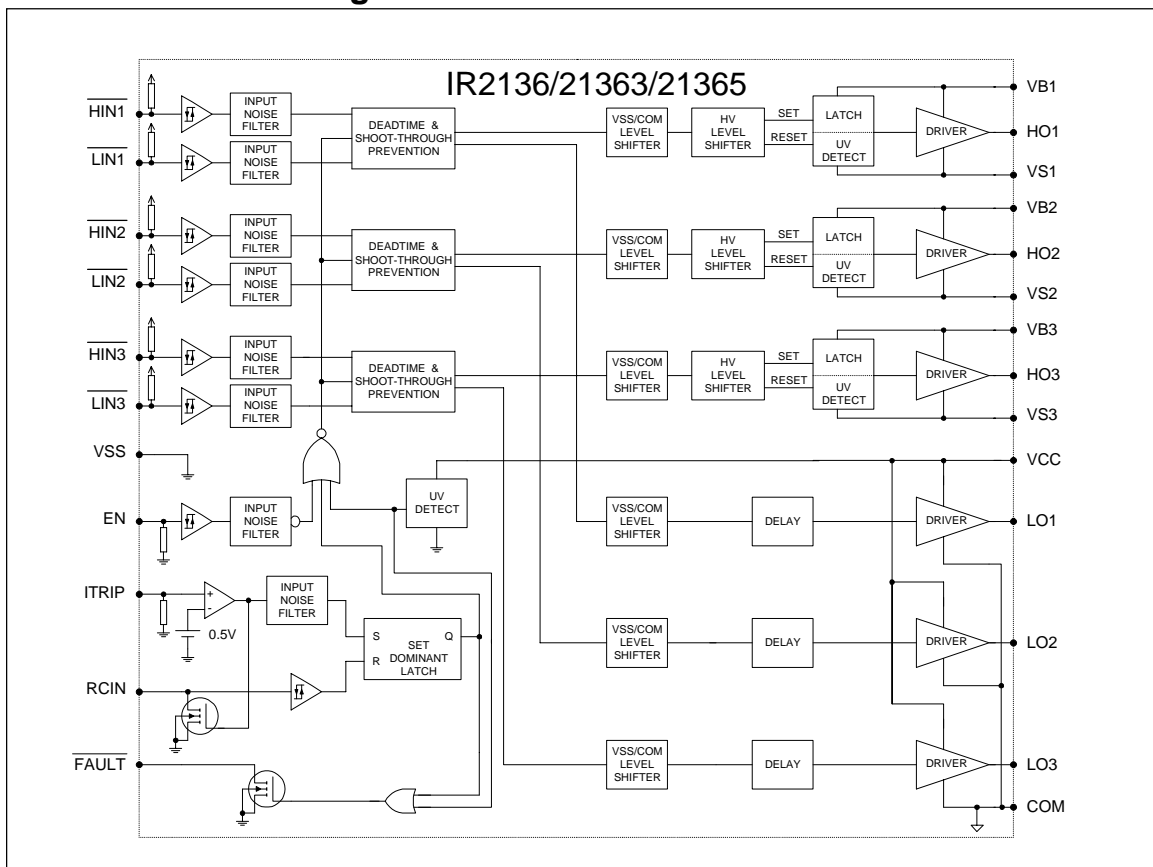
VCC	VBS	ITRIP	ENABLE	FAULT	LO1,2,3	HO1,2,3
<UVCC	X	X	X	0 (note 1)	0	0
15V	<UVBS	0V	5V	high imp	LIN1,2,3	0
15V	15V	0V	5V	high imp	LIN1,2,3	HIN1,2,3
15V	15V	>VITRIP	5V	0 (note 2)	0	0
15V	15V	0V	0V	high imp	0	0

Note: A shoot-through prevention logic prevents LO1,2,3 and HO1,2,3 for each channel from turning on simultaneously.

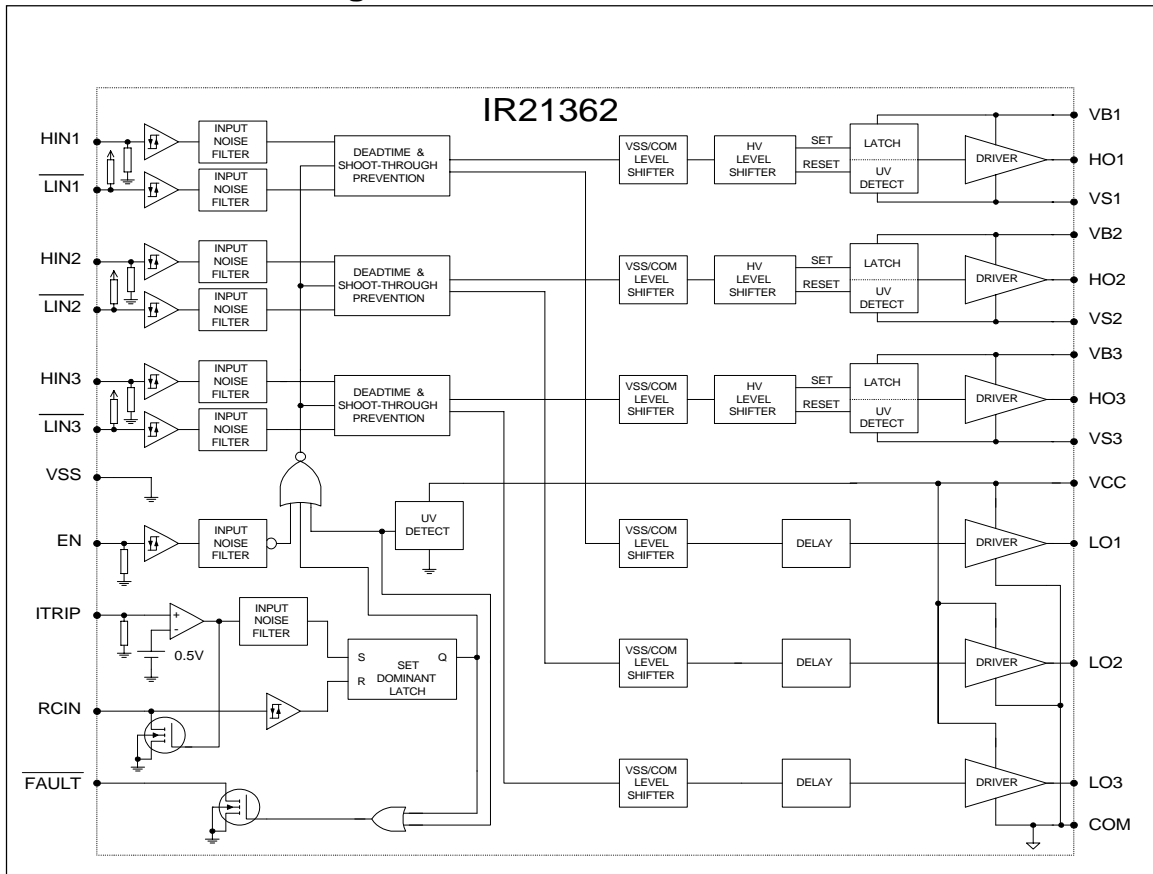
Note 1: UVCC is not latched, when VCC>UVCC, FAULT returns to high impedance.

Note 2: When ITRIP < VITRIP, FAULT returns to high-impedance after RCIN pin becomes greater than 8V (@ VCC = 15V)

Functional Block Diagram



Functional Block Diagram



Lead Definitions

Symbol	Description
V _{CC}	Low side and logic fixed supply
V _{SS}	Logic Ground
HIN _{1,2,3}	Logic inputs for high side gate driver outputs (HO _{1,2,3}), out of phase (IR2136/IR21363/IR21365)
HIN _{1,2,3}	Logic inputs for high side gate driver outputs (HO _{1,2,3}), in phase (IR21362)
LIN _{1,2,3}	Logic inputs for low side gate driver outputs (LO _{1,2,3}), out of phase
FAULT	Indicates over-current (ITRIP) or low-side undervoltage lockout has occurred. Negative logic, open-drain output
EN	Logic input to enable I/O functionality. Positive logic, i.e. I/O logic functions when ENABLE is high. No effect on FAULT and not latched
ITRIP	Analog input for overcurrent shutdown. When active, ITRIP shuts down outputs and activates FAULT and RCIN low. When ITRIP becomes inactive, FAULT stays active low for an externally set time T _{FLTCLR} , then automatically becomes inactive (open-drain high impedance).
RCIN	External RC network input used to define FAULT CLEAR delay, T _{FLTCLR} , approximately equal to R*C. When RCIN>8V, the FAULT pin goes back into open-drain high-impedance
COM	Low side gate driver return
V _{B1,2,3}	High side floating supply
HO _{1,2,3}	High side gate driver outputs
V _{S1,2,3}	High voltage floating supply returns
LO _{1,2,3}	Low side gate driver output

IR2136/IR21362/IR21363/IR21365(J&S)

Lead Assignments

<p>28 Lead PDIP</p>	<p>44 Lead PLCC w/o 12 leads</p>	<p>28 lead SOIC (wide body)</p>
<p>IR2136/IR21363/IR21365</p>	<p>IR2136/IR21363/IR21365 (J)</p>	<p>IR2136/IR21363/IR21365 (S)</p>

<p>28 Lead PDIP</p>	<p>44 Lead PLCC w/o 12 leads</p>	<p>28 lead SOIC (wide body)</p>
<p>IR21362</p>	<p>IR21362J</p>	<p>IR21362S</p>

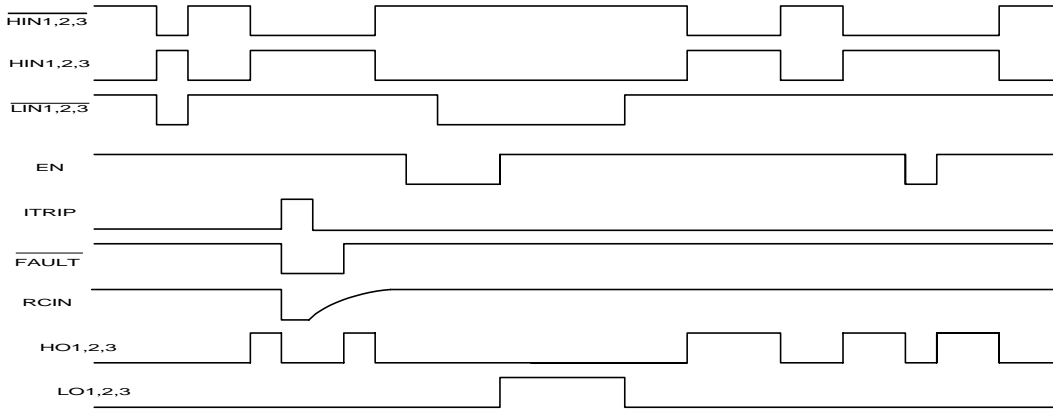


Figure 1. Input/Output Timing Diagram

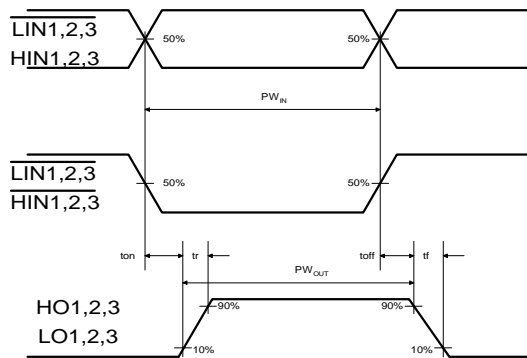


Figure 2. Switching Time Waveforms

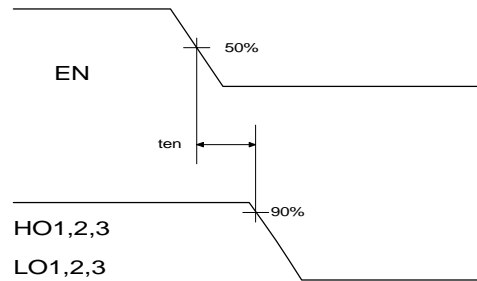


Figure 3. Output Enable Timing Waveform

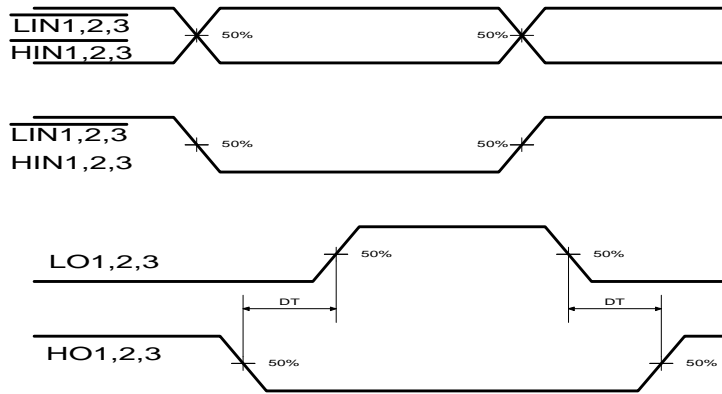


Figure 4. Internal Deadtime Timing Waveforms

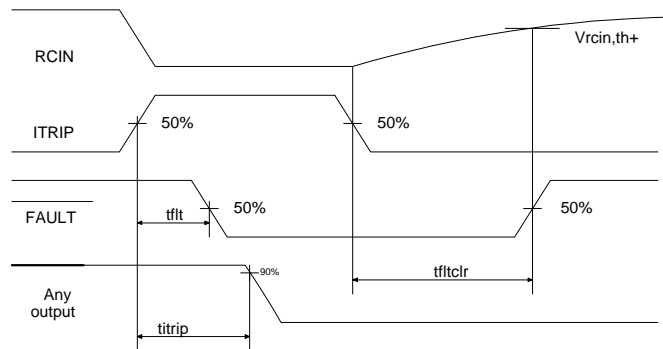


Figure 5. ITRIP/RCIN Timing Waveforms

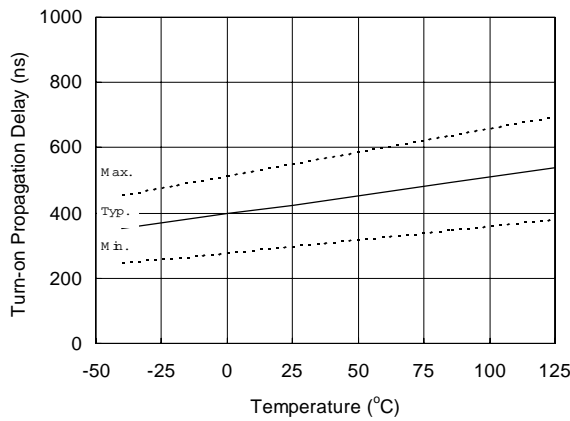


Figure 6A. Turn-on Propagation Delay vs. Temperature

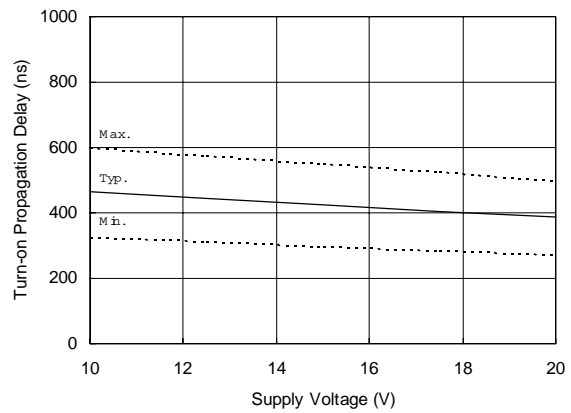


Figure 6B. Turn-on Propagation Delay vs. Supply Voltage

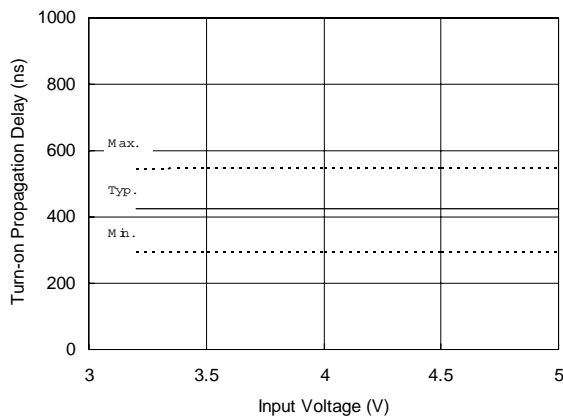


Figure 6C. Turn-on Propagation Delay vs. Input Voltage

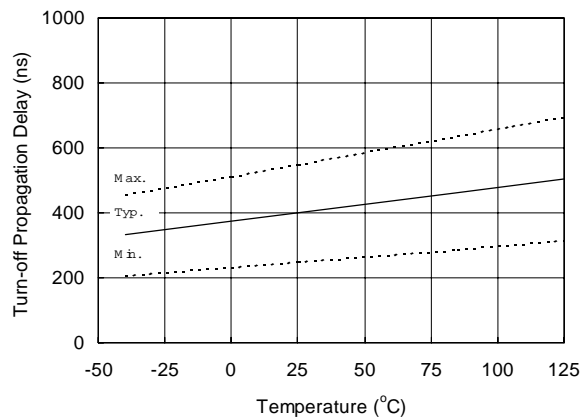


Figure 7A. Turn-off Propagation Delay vs. Temperature

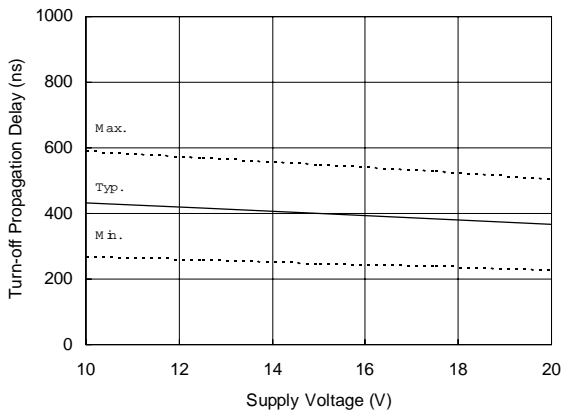


Figure 7B. Turn-off Propagation Delay vs. Supply Voltage

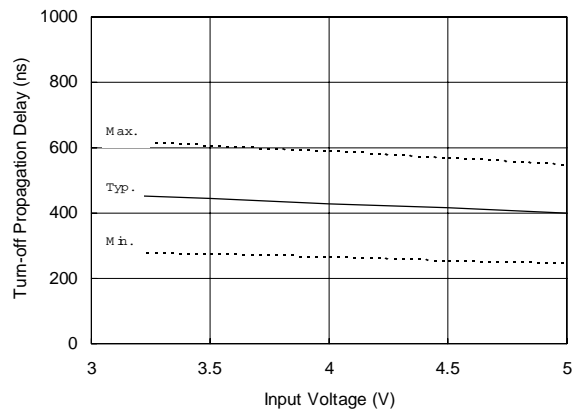


Figure 7C. Turn-off Propagation Delay vs. Input Voltage

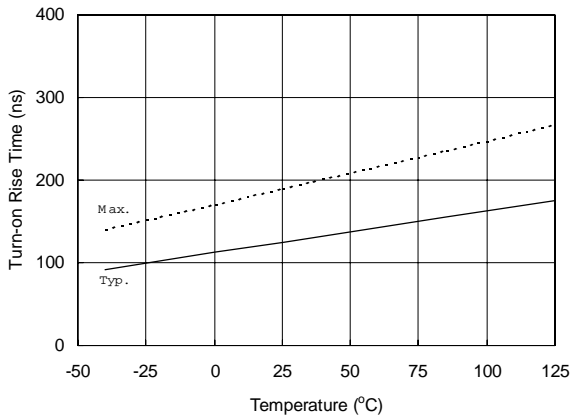


Figure 8A. Turn-on Rise Time vs. Temperature

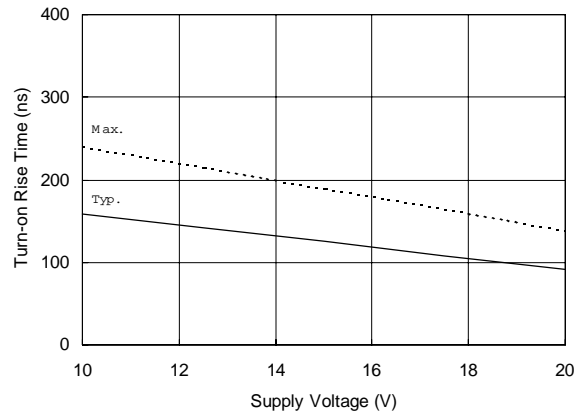


Figure 8B. Turn-on Rise Time vs. Supply Voltage

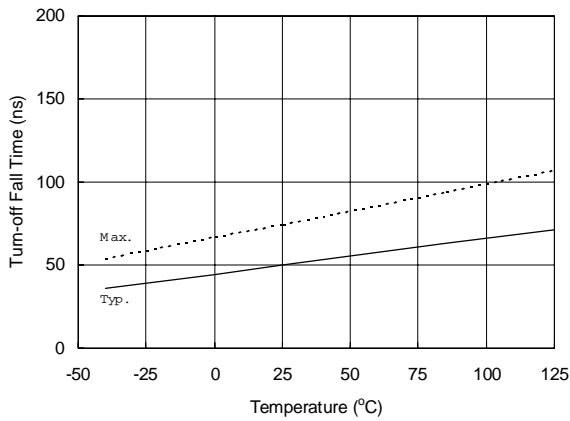


Figure 9A. Turn-off Fall Time vs. Temperature

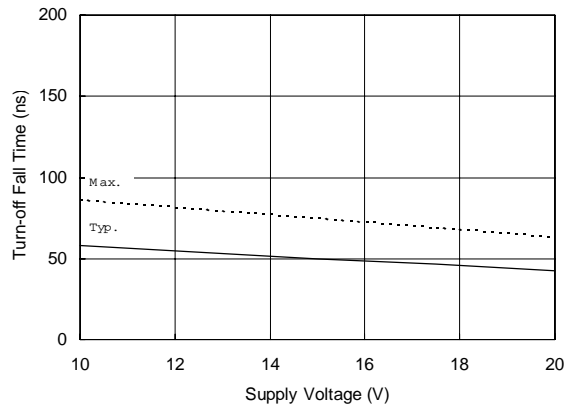


Figure 9B. Turn-off Fall Time vs. Supply Voltage

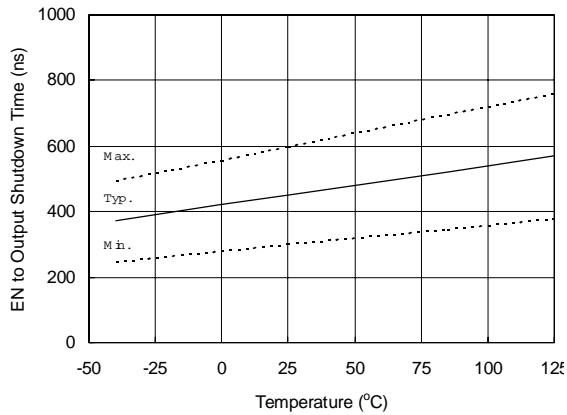


Figure 10A. EN to Output Shutdown Time vs. Temperature

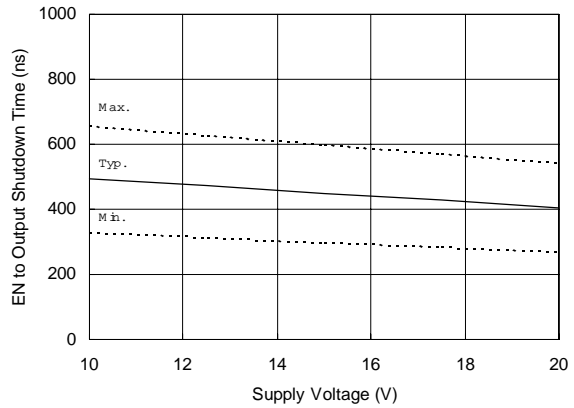


Figure 10B. EN to Output Shutdown Time vs. Supply Voltage

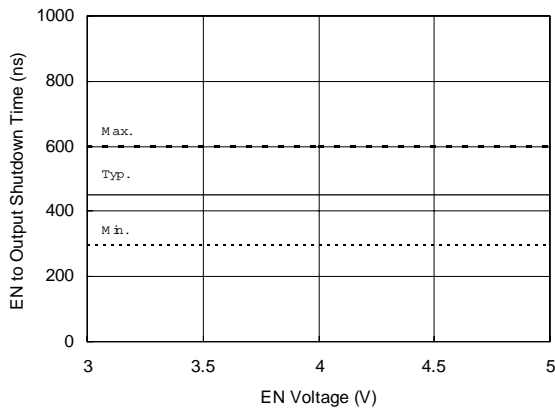


Figure 10C. EN to Output Shutdown Time vs. EN Voltage

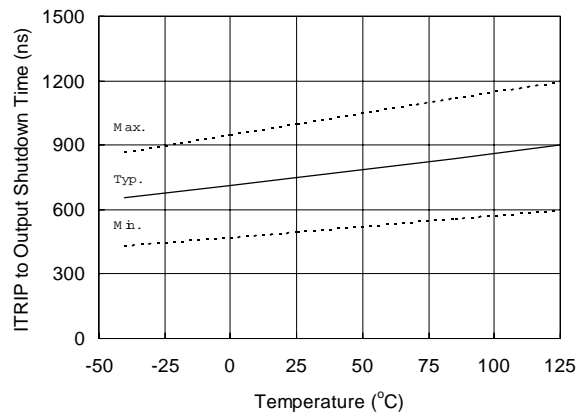


Figure 11A. ITRIP to Output Shutdown Time vs. Temperature

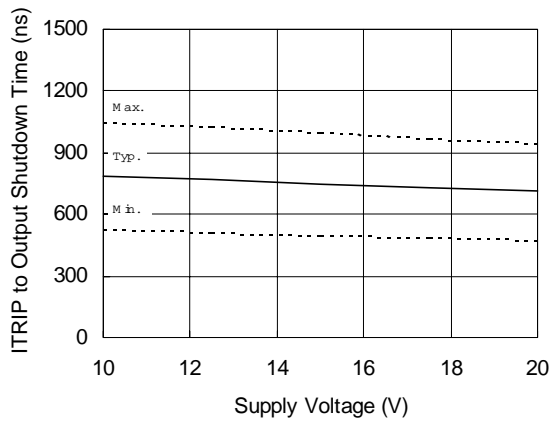


Figure 11B. ITRIP to Output Shutdown Time vs. Supply Voltage

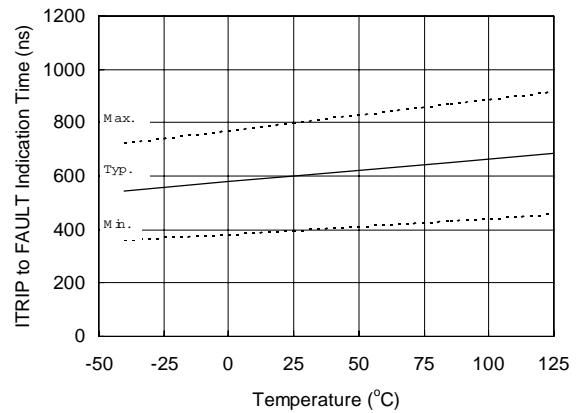


Figure 12A. ITRIP to FAULT Indication Time vs. Temperature

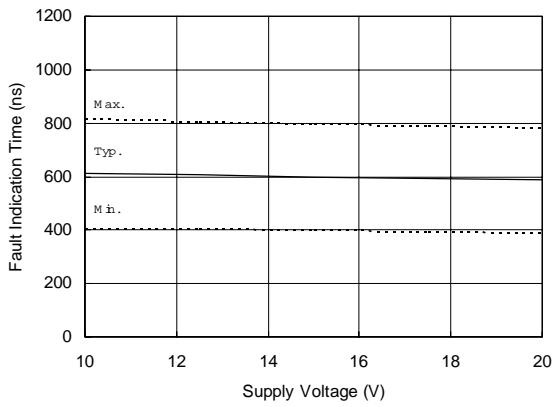


Figure 12B. ITRIP to FAULT Indication Time vs. Supply Voltage

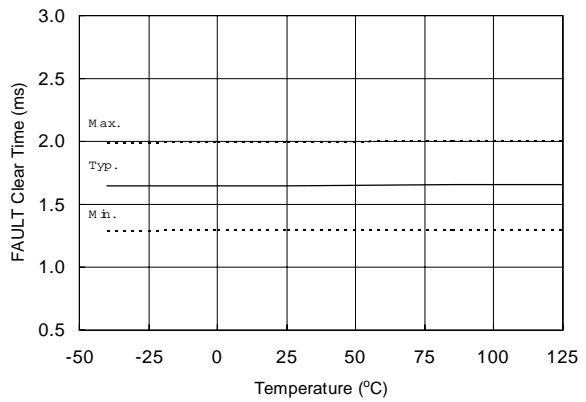


Fig13A. FAULT Clear Time vs. Temperature

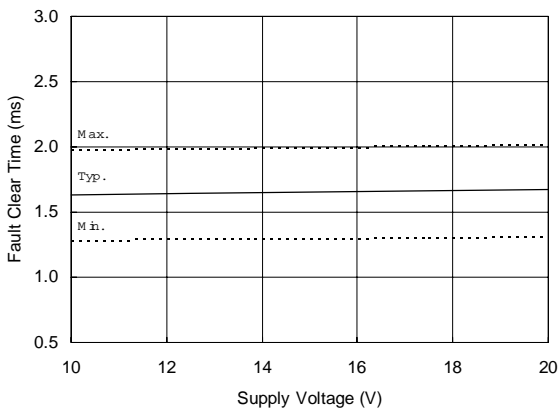


Figure 13B. FAULT Clear Time vs. Supply Voltage

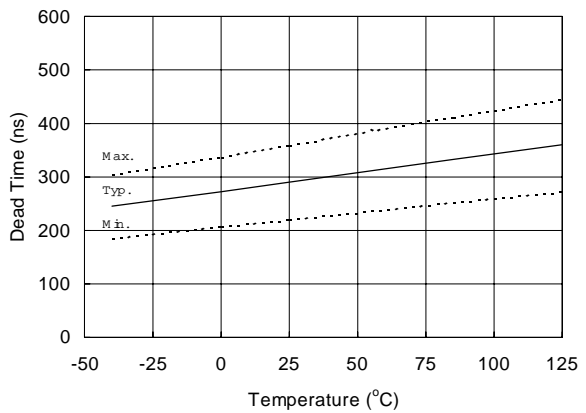


Figure 14A. Dead Time vs. Temperature

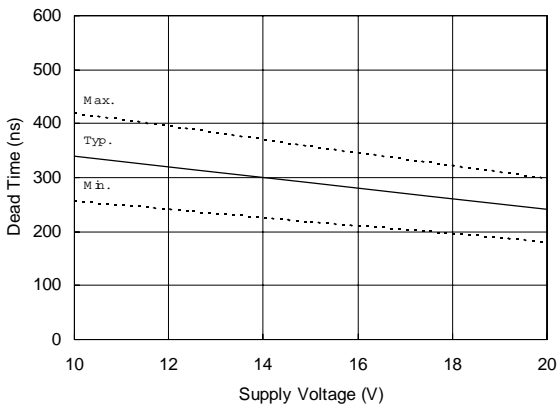


Figure 14B. Dead Time Time vs. Supply Voltage

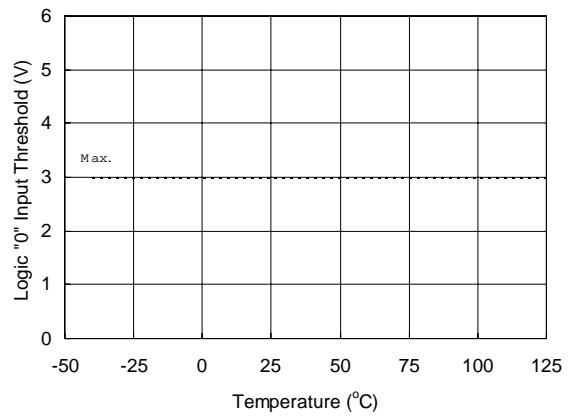


Figure 15A. Logic "0" Input Threshold vs. Temperature

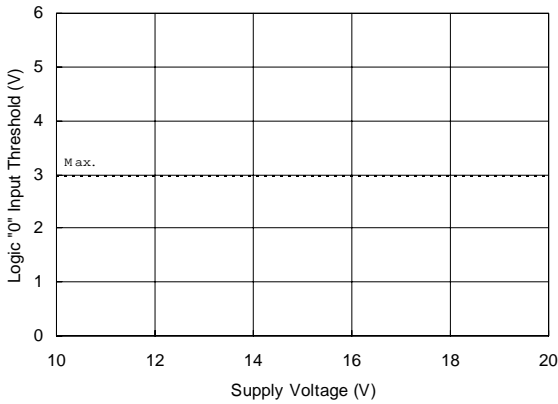


Figure 15B. Logic "0" Input Threshold vs. Supply Voltage

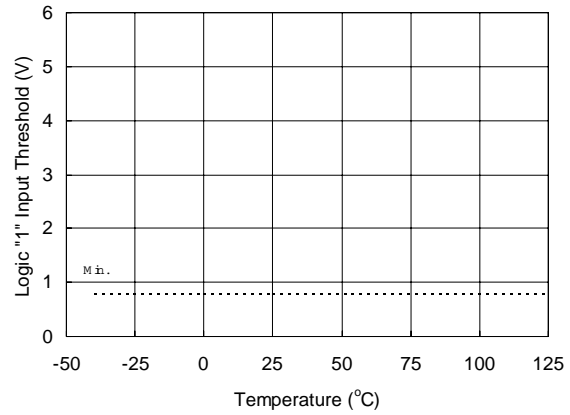


Figure 16A. Logic "1" Input Threshold vs. Temperature

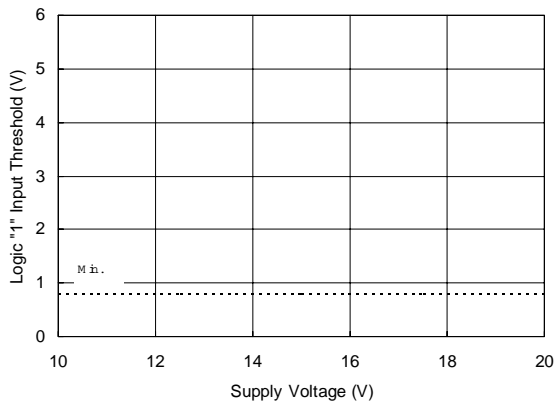


Figure 16B. Logic "1" Input Threshold vs. Supply Voltage

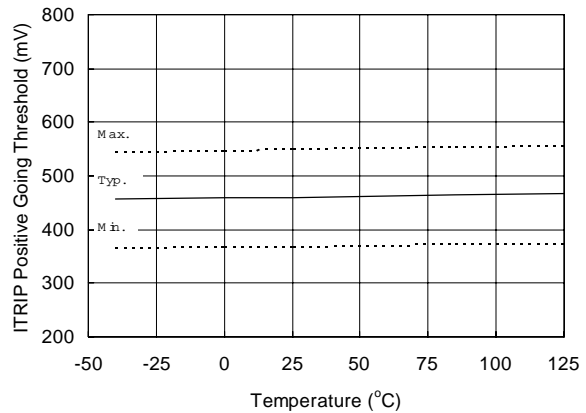


Figure 17A. ITRIP Positive Going Threshold vs. Temperature (IR2136/21362/21363 Only)

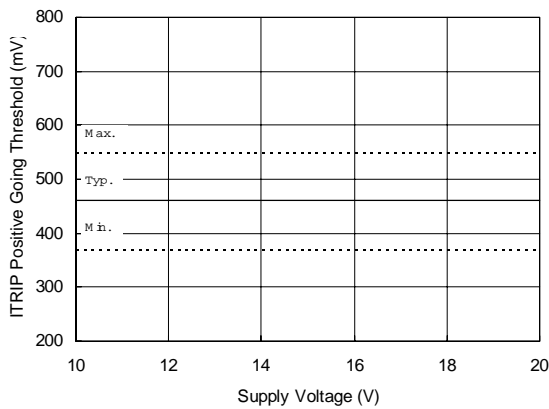


Figure 17B. ITRIP Positive Going Threshold vs. Supply Voltage (IR2136/21362/21363 Only)

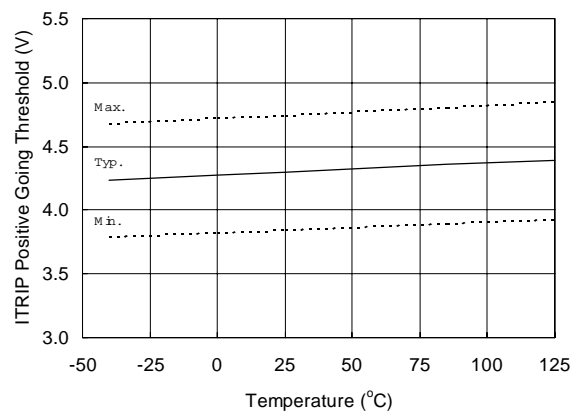


Figure 17C. ITRIP Positive Going Threshold vs. Temperature (IR21365 Only)

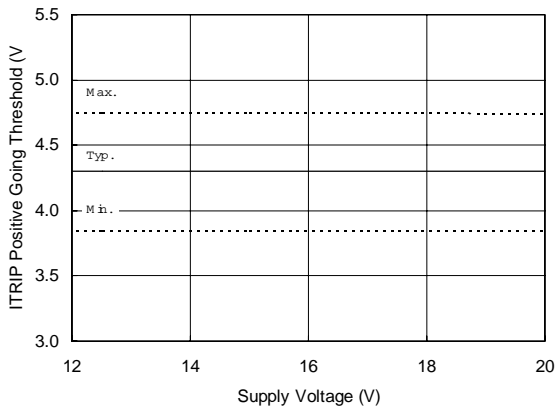


Figure 17D. ITRIP Positive Going Threshold vs. Supply Voltage (IR21365 Only)

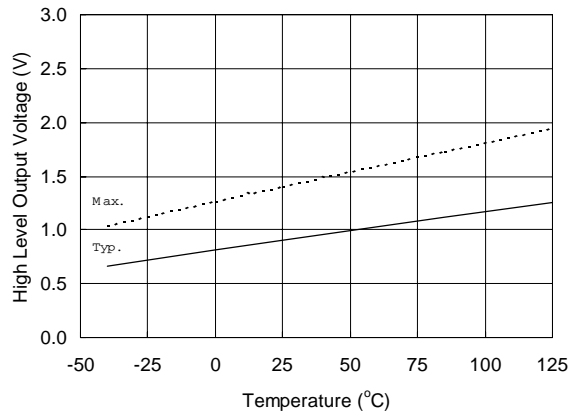


Figure 18A. High Level Output vs. Temperature

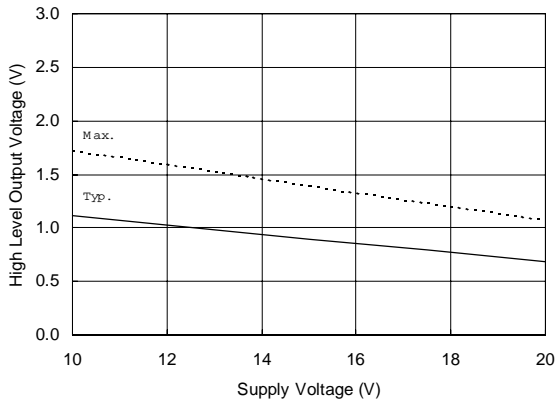


Figure 18B. High Level Output vs. Supply Voltage

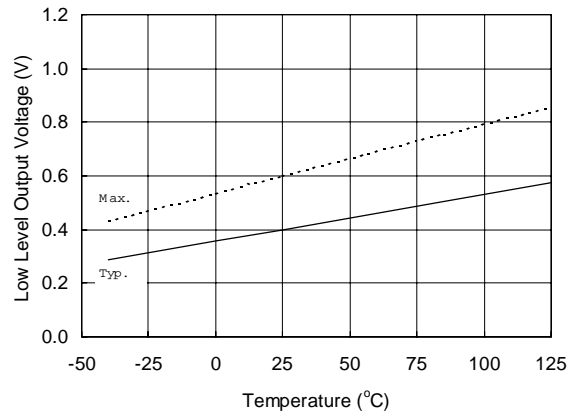


Figure 19A. Low Level Output vs. Temperature

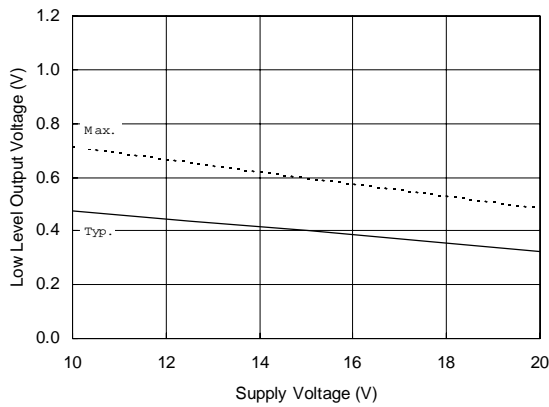


Figure 19B. Low Level Output vs. Supply Voltage

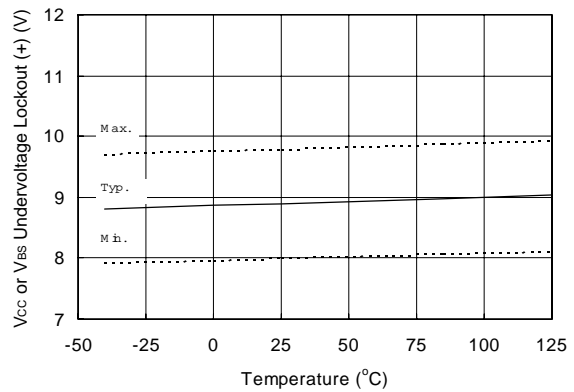


Figure 20. V_{CC} or V_{BS} Undervoltage (+) vs. Temperature (IR2136 Only)

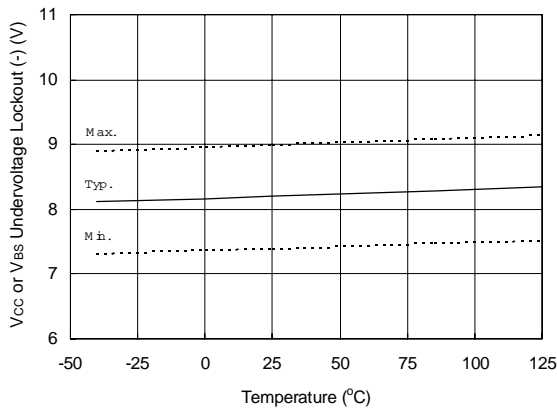


Figure 21. V_{CC} or V_{BS} Undervoltage (-) vs. Temperature (IR2136 Only)

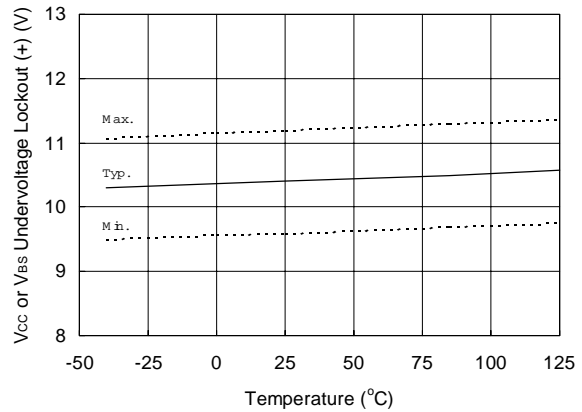


Figure 22. V_{CC} or V_{BS} Undervoltage (+) vs. Temperature (IR21362 Only)

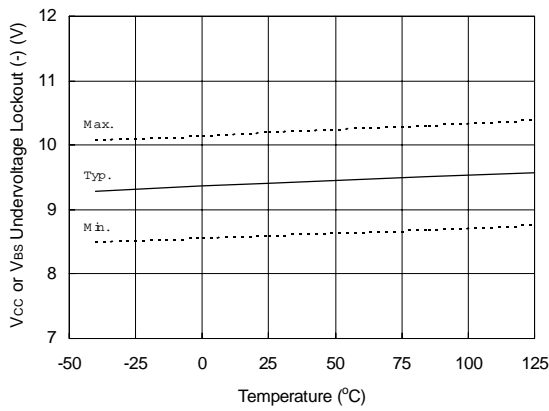


Figure 23. V_{CC} or V_{BS} Undervoltage (-) vs. Temperature (IR21362 Only)

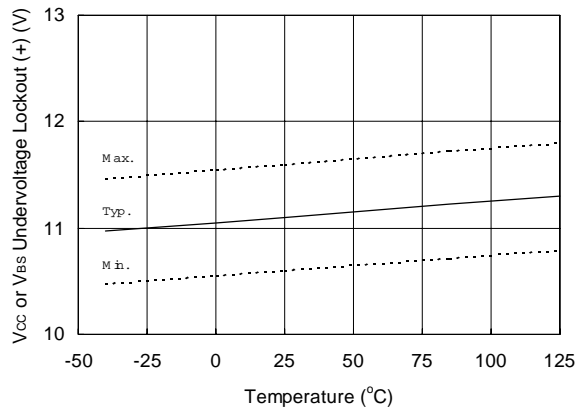


Figure 24. V_{CC} or V_{BS} Undervoltage (+) vs. Temperature (IR21363/21365 Only)

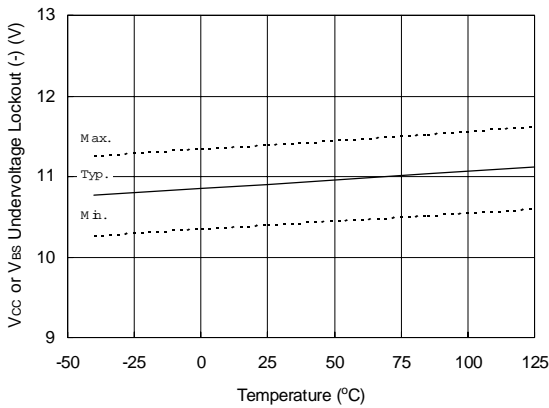


Figure 25. V_{CC} or V_{BS} Undervoltage (-) vs. Temperature (IR21363/21365 Only)

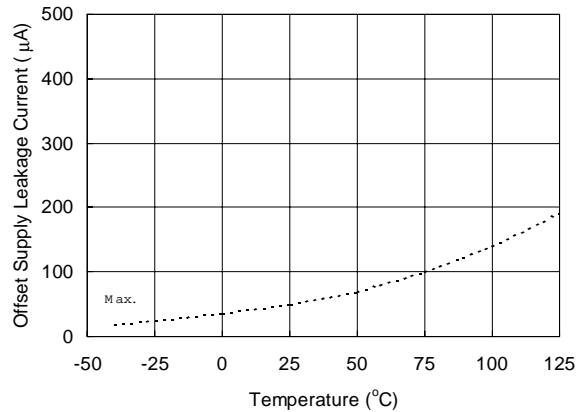


Figure 26A. Offset Supply Leakage Current vs. Temperature

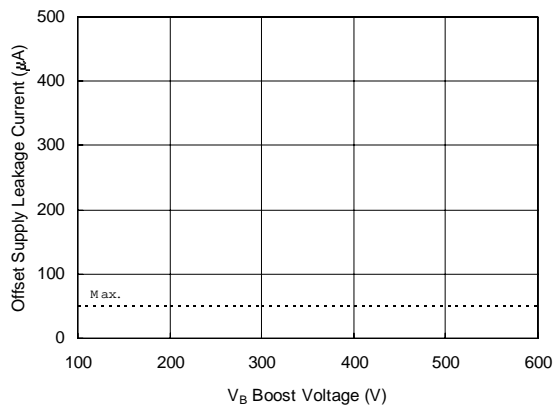


Figure 26B. Offset Supply Leakage Current vs. V_B Boost Voltage

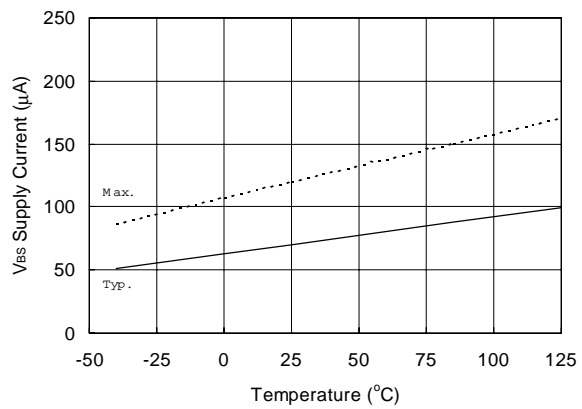


Figure 27A. V_{BS} Supply Current vs. Temperature

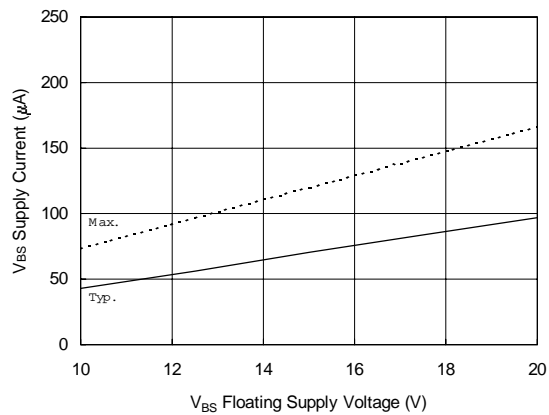


Figure 27B. V_{BS} Supply Current vs. V_{BS} Floating Supply Voltage

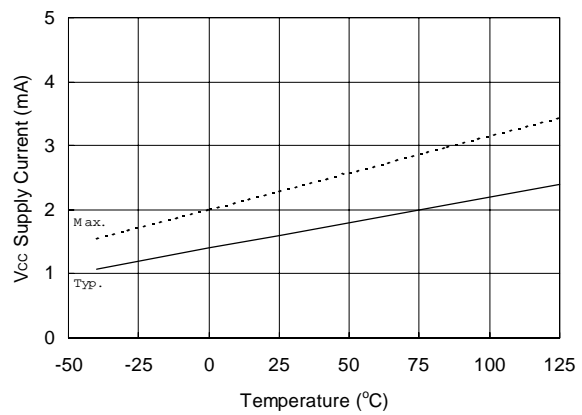


Figure 28A. V_{CC} Supply Current vs. Temperature

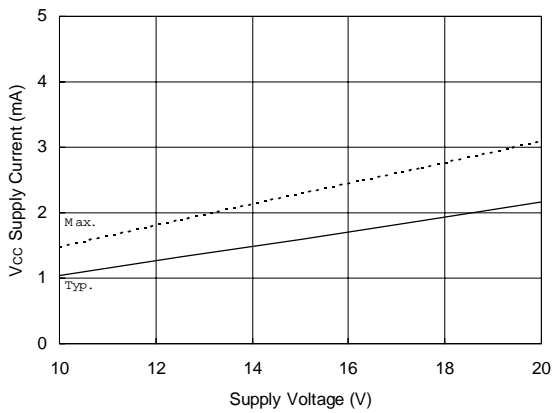


Figure 28B. V_{CC} Supply Current vs. V_{CC} Supply Voltage

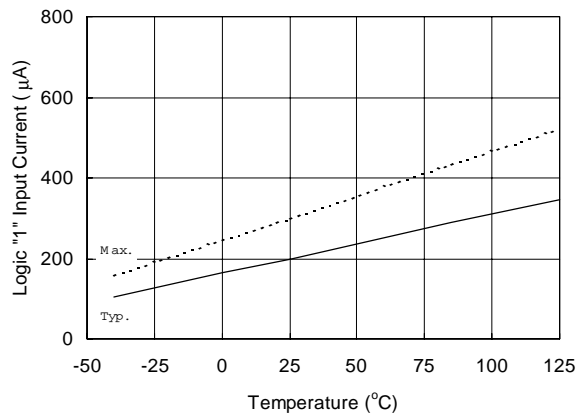


Figure 29A. Logic "1" Input Current vs. Temperature (IR2136/21363/21365 and IR21362 Low Side Only)

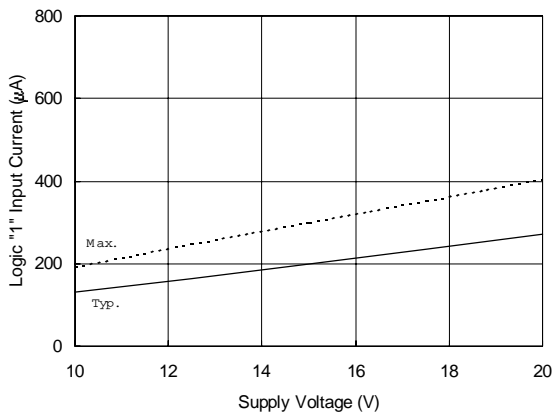


Figure 29B. Logic "1" Input Current vs. Supply Voltage (IR2136/21363/21365 and IR21362 Low Side Only)

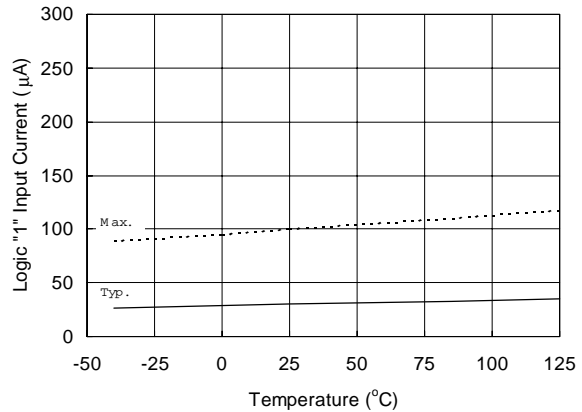


Figure 29C. Logic "1" Input Current vs. Temperature (IR21362 High Side Only)

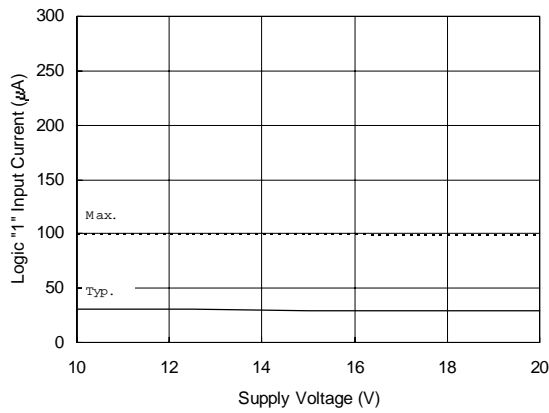


Figure 29D. Logic "1" Input Current vs. Supply Voltage (IR21362 High Side Only)

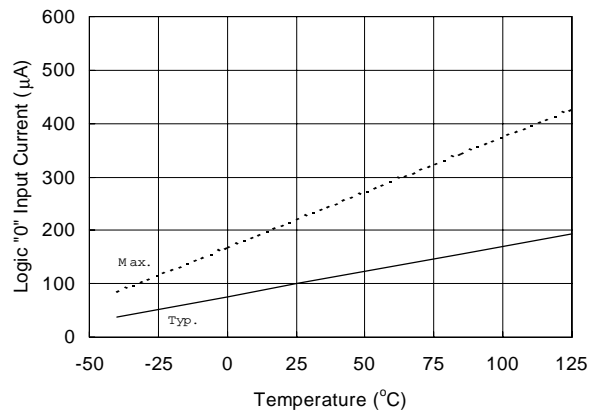


Figure 30A. Logic "0" Input Current vs. Temperature (IR2136/21363/21365 and IR21362 Low Side Only)

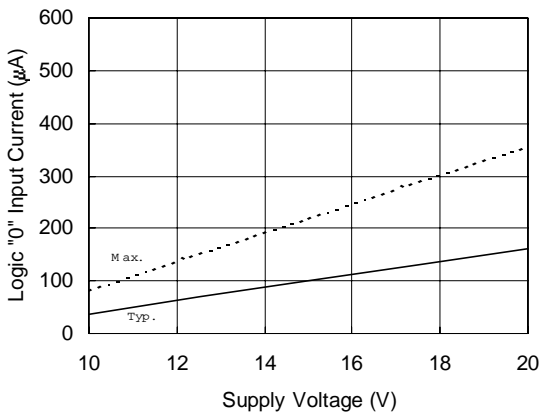


Figure 30B. Logic "0" Input Current vs. Supply Voltage (IR2136/21363/21365 and IR21362 Low Side Only)

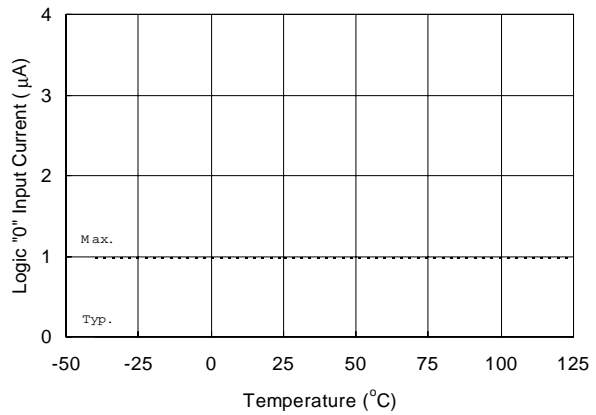


Figure 30C. Logic "0" Input Current vs. Temperature (IR21362 High Side Only)

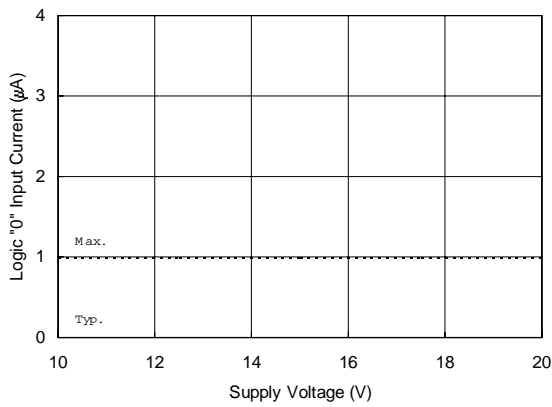


Figure 30D. Logic "0" Input Current vs. Supply Voltage (IR21362 High Side Only)

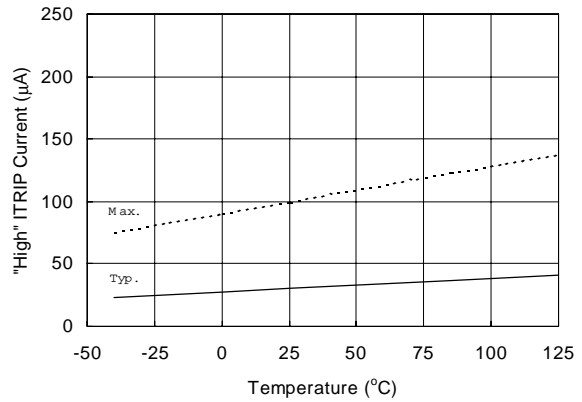


Figure 31A. "High" ITRIP Current vs. Temperature

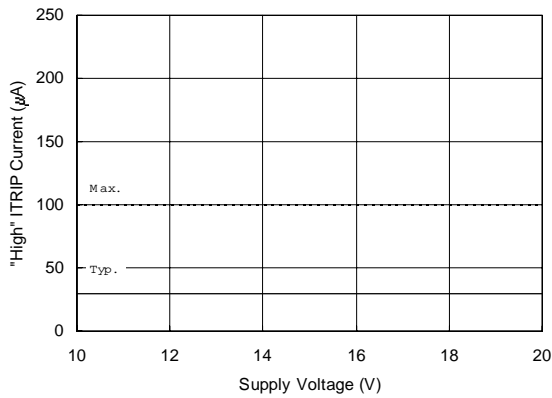


Figure 31B. "High" ITRIP Current vs. Supply Voltage

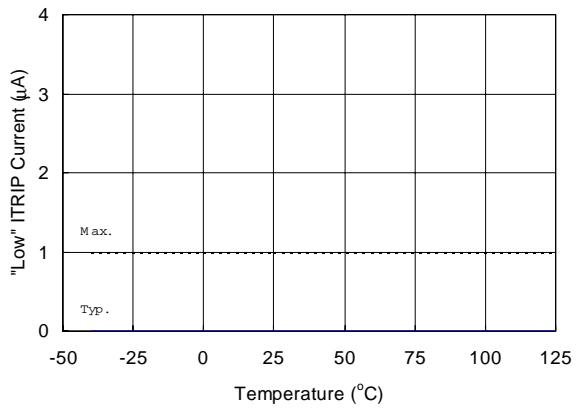


Figure 32A. "Low" ITRIP Current vs. Temperature

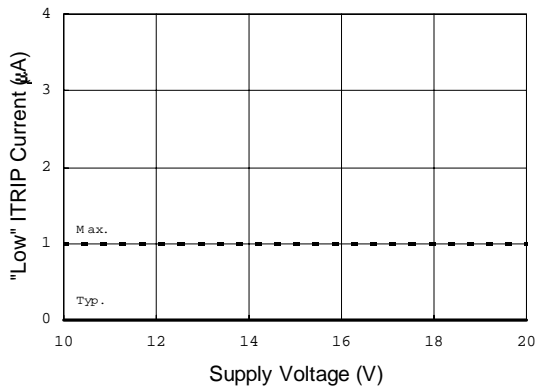


Figure 32B. "Low" ITRIP Current vs. Supply Voltage

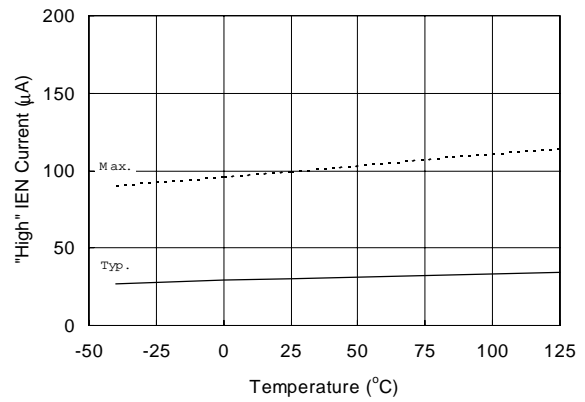


Figure 33A. "High" IEN Current vs. Temperature

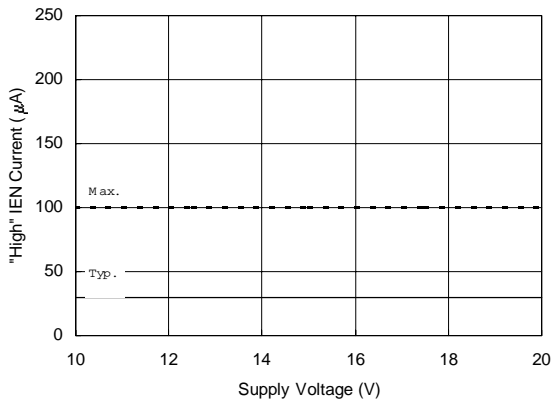


Figure 33B. "High" IEN Current vs. Supply Voltage

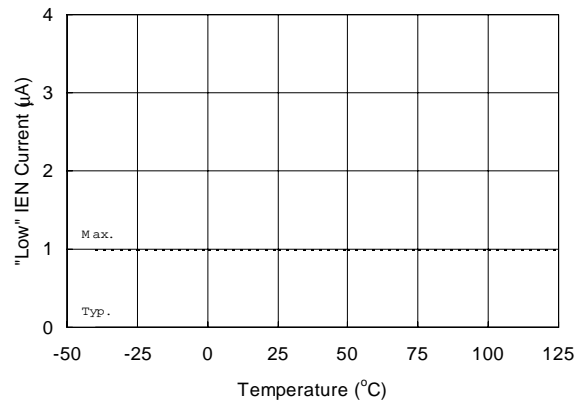


Figure 34A. "Low" IEN Current vs. Temperature

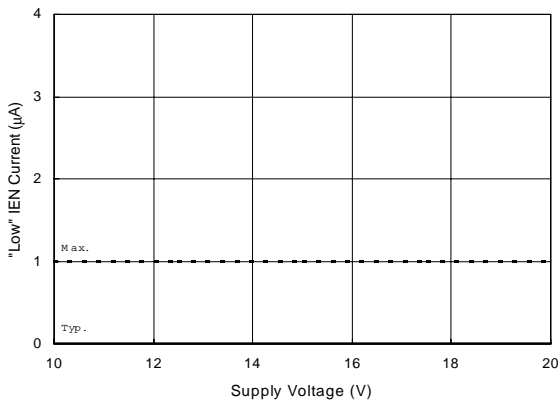


Figure 34B. "Low" IEN Current vs. Supply Voltage

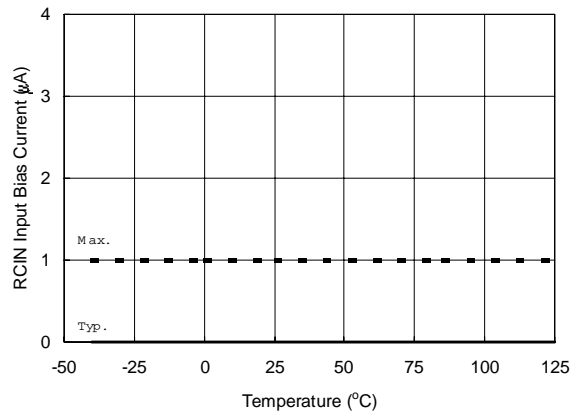


Figure 35A. RCIN Input Bias Current vs. Temperature

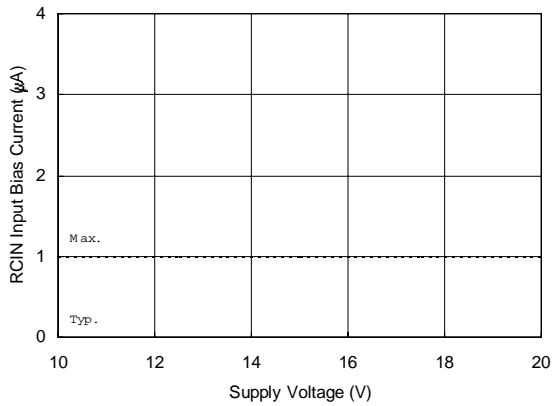


Figure 35B. RCIN Input Bias Current vs. Supply Voltage

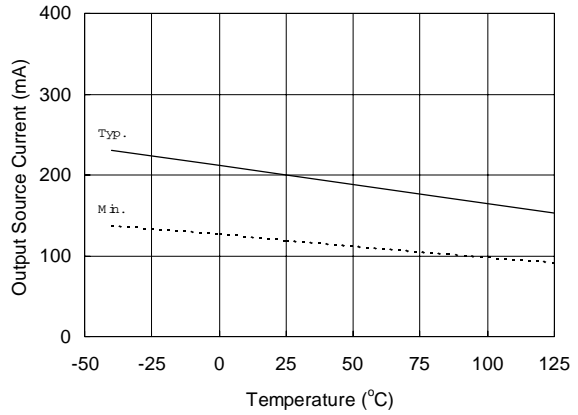


Figure 36A. Output Source Current vs. Temperature

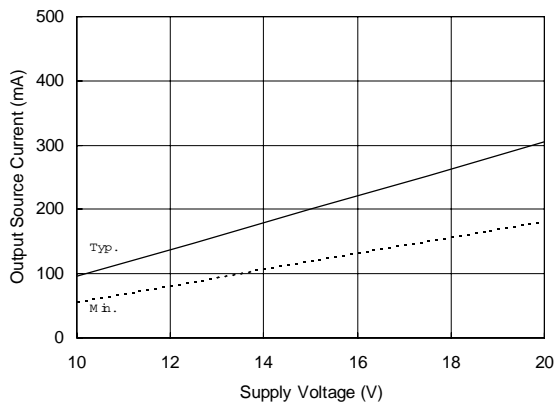


Figure 36B. Output Source Current vs. Supply Voltage

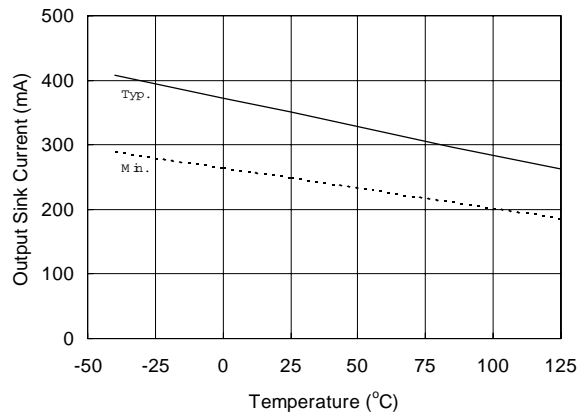


Figure 37A. Output Sink Current vs. Temperature

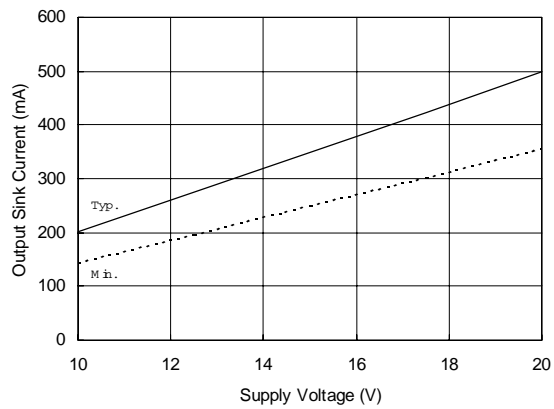


Figure 37B. Output Sink Current vs. Supply Voltage

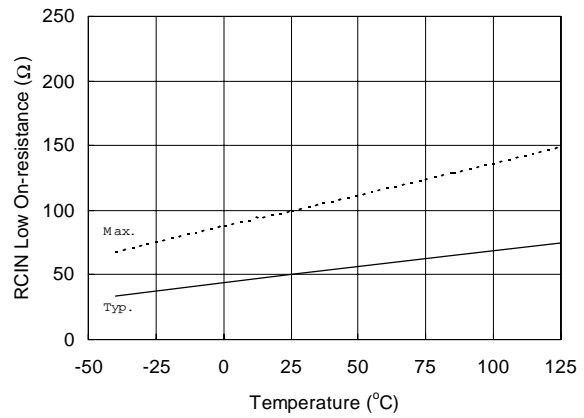


Figure 38A. RCIN Low On-resistance vs. Temperature

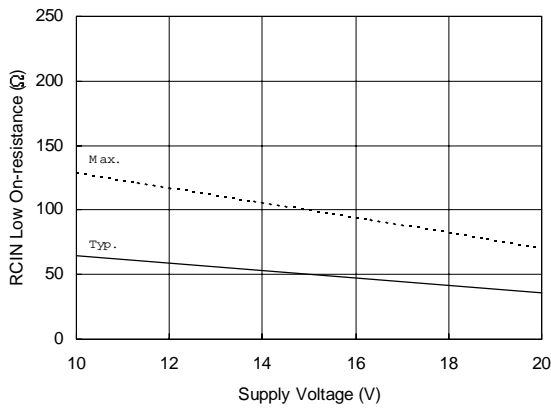


Figure 38B. RCIN Low On-resistance vs. Supply Voltage

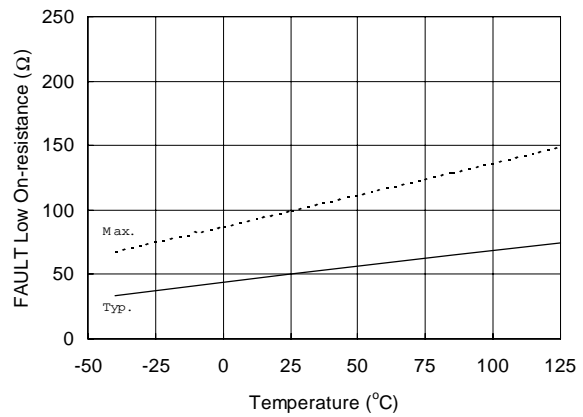


Figure 39A. FAULT Low On-resistance vs. Temperature

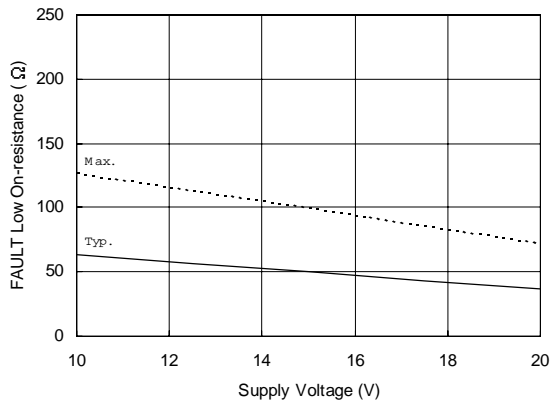


Figure 39B. FAULT Low On-resistance vs. Supply Voltage

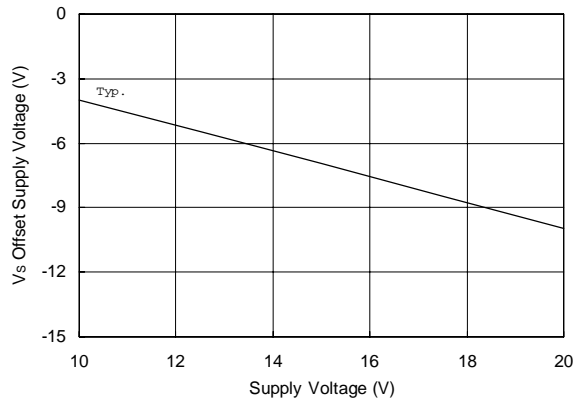
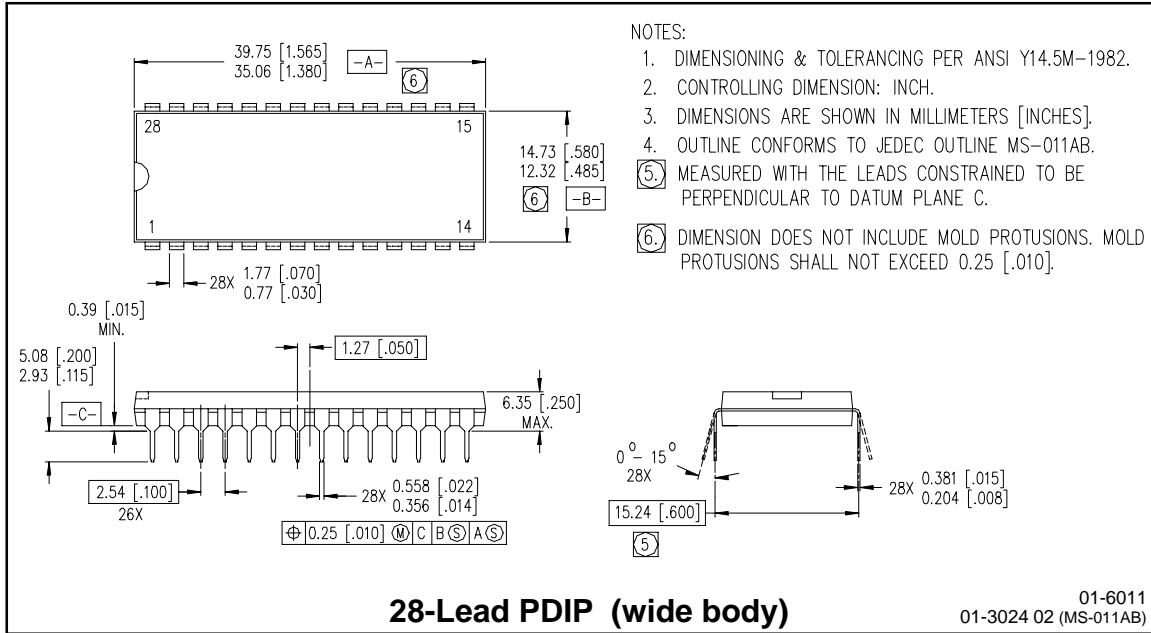
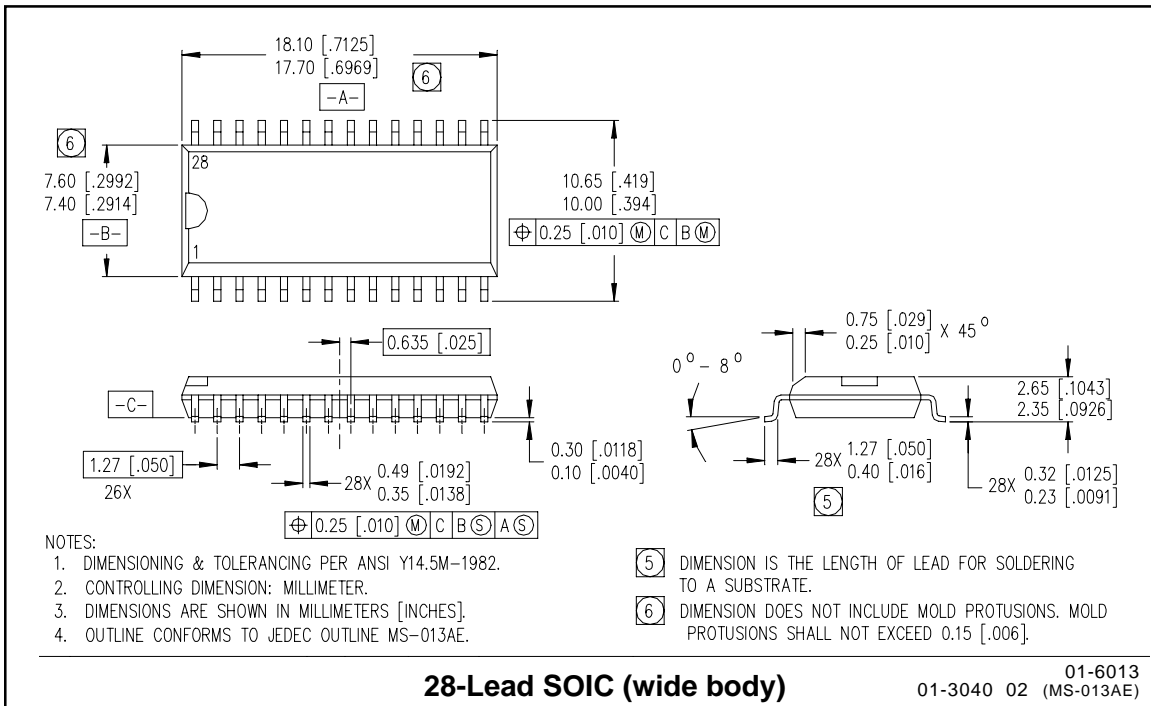


Figure 40. Maximum V_S Negative Offset vs. V_{BS} Supply Voltage

Case outlines



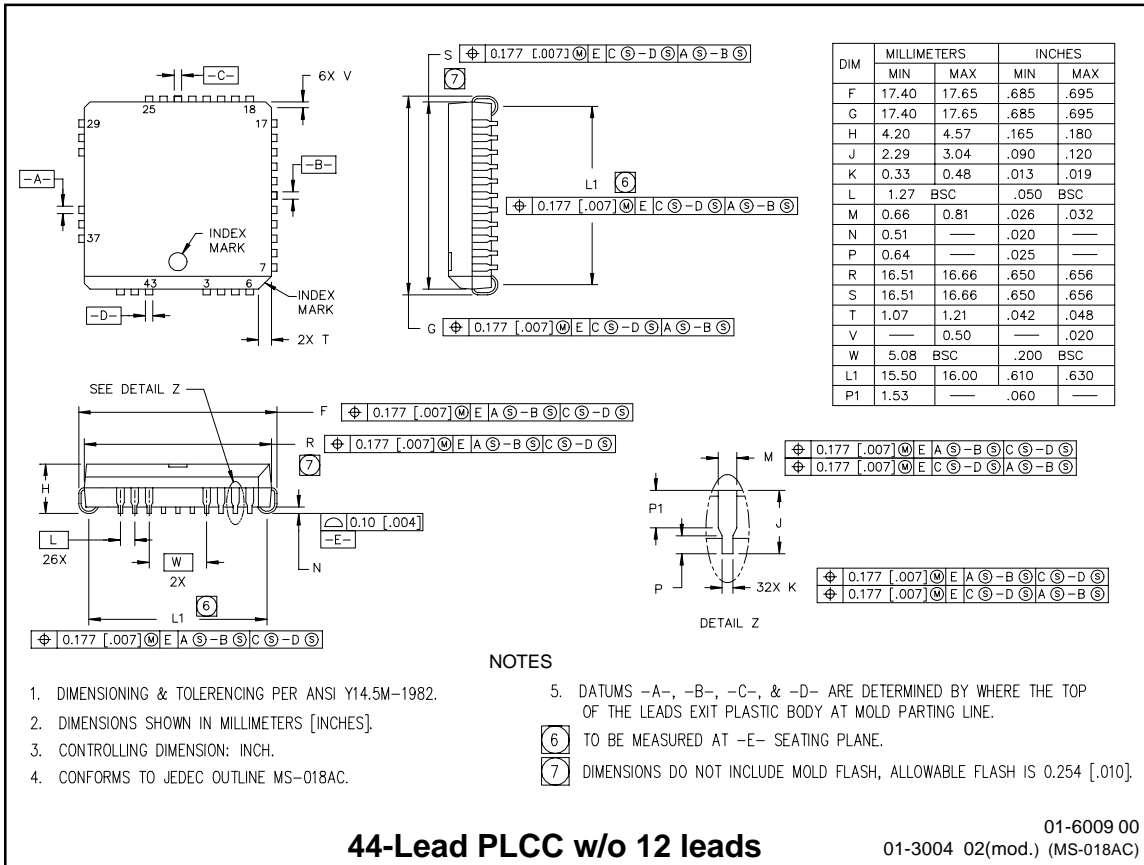
- NOTES:
1. DIMENSIONING & TOLERANCING PER ANSI Y14.5M-1982.
 2. CONTROLLING DIMENSION: INCH.
 3. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
 4. OUTLINE CONFORMS TO JEDEC OUTLINE MS-011AB.
 - ⑤ MEASURED WITH THE LEADS CONSTRAINED TO BE PERPENDICULAR TO DATUM PLANE C.
 - ⑥ DIMENSION DOES NOT INCLUDE MOLD PROTUSIONS. MOLD PROTUSIONS SHALL NOT EXCEED 0.25 [.010].



- NOTES:
1. DIMENSIONING & TOLERANCING PER ANSI Y14.5M-1982.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
 4. OUTLINE CONFORMS TO JEDEC OUTLINE MS-013AE.
 - ⑤ DIMENSION IS THE LENGTH OF LEAD FOR SOLDERING TO A SUBSTRATE.
 - ⑥ DIMENSION DOES NOT INCLUDE MOLD PROTUSIONS. MOLD PROTUSIONS SHALL NOT EXCEED 0.15 [.006].

IR2136/IR21362/IR21363/IR21365(J&S)

International
IR Rectifier



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