

600V IGBT

PRODUCT SUMMARY		
V_{CE} (V)	600	
I_C (A)	50 (TC=25°C)	25 (TC=100°C)
$V_{CE(sat)}$ (V)	1.9	
I_{CM} (A)	75	

FEATURES

- Very Low V_{CEsat}
- Low turn-off losses
- High speed switching
- Maximum junction temperature 175°C
- Ultra low gate charge (Q_g)
- Avalanche energy rated (UIS)



RoHS
COMPLIANT
HALOGEN
FREE

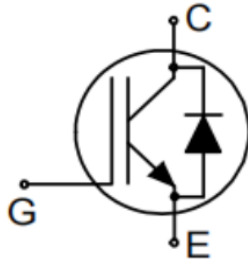
APPLICATIONS

- Telecommunications
 - Server and telecom power supplies
- Lighting
 - High-intensity discharge (HID)
 - Fluorescent ballast lighting
- Consumer and computing
 - ATX power supplies
- Industrial
 - Welding
 - Battery chargers
- Renewable energy
 - Solar (PV inverters)
- Switch mode power supplies (SMPS)

TO-263



Top View



Package pin definition

- Pin1 G - Gate
- Pin2 C & backside - Collector
- Pin3 E - Emitter

ABSOLUTE MAXIMUM RATINGS (T _C = 25 °C, unless otherwise noted)					
PARAMETER			SYMBOL	LIMIT	UNIT
Collector-Emitter Voltage			V _{CE}	600	V
Gate-Emitter Voltage			V _{GE}	±30	
Continuous Collector Current (T _J = 150 °C)	V _{GE} at 15 V	T _C = 25 °C	I _C	50	A
		T _C = 100 °C		25	
Pulsed Collector Current ^a			I _{CM}	75	
Diode Forward Current ^b			I _F	25	A
Maximum Power Dissipation		T _C = 25 °C	P _D	92	W
		T _C = 100 °C		58	W
Operating Junction and Storage Temperature Range			T _J , T _{stg}	-55 to +175	°C
Short Circuit Withstand Time ^{TC=150°C}	V _{GE} = 15V, V _{CE} ≤ 400V		t _{sc}	3	μs
Short Circuit Withstand Time ^{TC=100°C}	V _{GE} = 15V, V _{CE} ≤330V			5	
Soldering Recommendations (Peak Temperature) ^c	for 10 s			260	°C

Notes

- Repetitive rating; pulse width limited by maximum junction temperature.
- Current limited by maximum junction temperature.
- 1.6 mm from case.

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	R_{thJA}	-	40	°C/W
Maximum Junction-to-Case	R_{thJC}	-	1.5	

SPECIFICATIONS ($T_J = 25\text{ °C}$, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Collector-Emitter Breakdown Voltage	BV_{CE}	$V_{GE} = 0\text{ V}$, $I_C = 250\text{ }\mu\text{A}$ $V_{GE} = 0\text{ V}$, $I_C = 1\text{ mA}$	600 600	- -	- -	V
Gate-Source Threshold Voltage (N)	$V_{GE(th)}$	$V_{CE} = V_{GE}$, $I_D = 250\text{ }\mu\text{A}$	4	5	6	V
Zero Gate Voltage Collector Current	I_{CES}	$V_{CE} = 600\text{ V}$, $V_{GE} = 0\text{ V}$, $T_J = 25\text{ °C}$	-	1	20	μA
		$V_{CE} = 600\text{ V}$, $V_{GE} = 0\text{ V}$, $T_J = 150\text{ °C}$	-	1000	-	μA
Gate-Emitter Leakage Current	I_{GES}	$V_{CE} = 0\text{ V}$, $V_{GS} = \pm 20\text{ V}$	-	-	100	nA
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE} = 15\text{ V}$ $I_C = 30\text{ A}$	-	1.9	2.1	V
Forward Transconductance	g_{fs}	$V_{CE} = 20\text{ V}$, $I_C = 30\text{ A}$	-	40	-	S
Dynamic						
Input Capacitance	C_{ies}	$V_{GE} = 0\text{ V}$, $V_{CE} = 25\text{ V}$, $f = 500\text{ KHz}$	-	3200	-	pF
Output Capacitance	C_{oes}		-	87	-	
Reverse Transfer Capacitance	C_{res}		-	25	-	
Turn-on Energy	E_{on}	$V_{CE} = 400\text{ V}$, $V_{GE} = 0/15\text{ V}$, $I_C = 30\text{ A}$, $R_g = 15\Omega$	-	0.48	-	nJ
Turn-off Energy	E_{off}		-	0.31	-	
Total Gate Charge	Q_g	$V_{GE} = 15\text{ V}$ $I_C = 30\text{ A}$, $V_{CE} = 400\text{ V}$	-	24	-	nC
Gate-Emitter Charge	Q_{ge}		-	18	-	
Gate to Collector Charge	Q_{gc}		-	55	-	
Turn-On Delay Time	$t_{d(on)}$	$V_{CE} = 400\text{ V}$, $V_{GE} = 0/15\text{ V}$, $I_C = 30\text{ A}$, $R_g = 10\Omega$	-	33	-	ns
Rise Time	t_r		-	33	-	
Turn-Off Delay Time	$t_{d(off)}$		-	152	-	
Fall Time	t_f		-	40	-	
Internal emitter inductance measured 5 mm	L_E		-	13	-	nH
Diode Characteristics						
Diode Forward Current	I_F	IGBT symbol showing the integral reverse junction diode	-	-	25	A
Pulsed Diode Forward Current	I_{FM}		-	-	75	
Diode Forward Voltage	V_F	$I_F = 30\text{ A}$	-	1.94	2.0	V
Reverse Recovery Time	t_{rr}	$T_J = 25\text{ °C}$, $I_F = 30\text{ A}$, $di_F/dt = 200\text{ A}/\mu\text{s}$, $V_R = 400\text{ V}$	-	80	-	ns
Reverse Recovery Charge	Q_{rr}		-	0.26	-	μC
Reverse Recovery Current	I_{RRM}		-	13	-	A

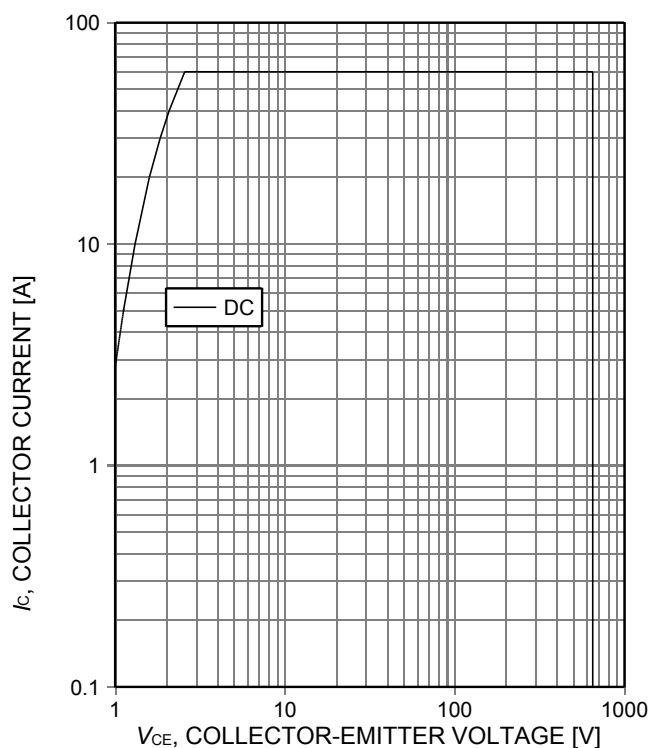


Figure 1. **Forward bias safe operating area**
 ($D=0$, $T_C=25^\circ\text{C}$, $T_{vj}\leq 175^\circ\text{C}$; $V_{GE}=15\text{V}$.
 Recommended use at $V_{GE}\geq 7.5\text{V}$)

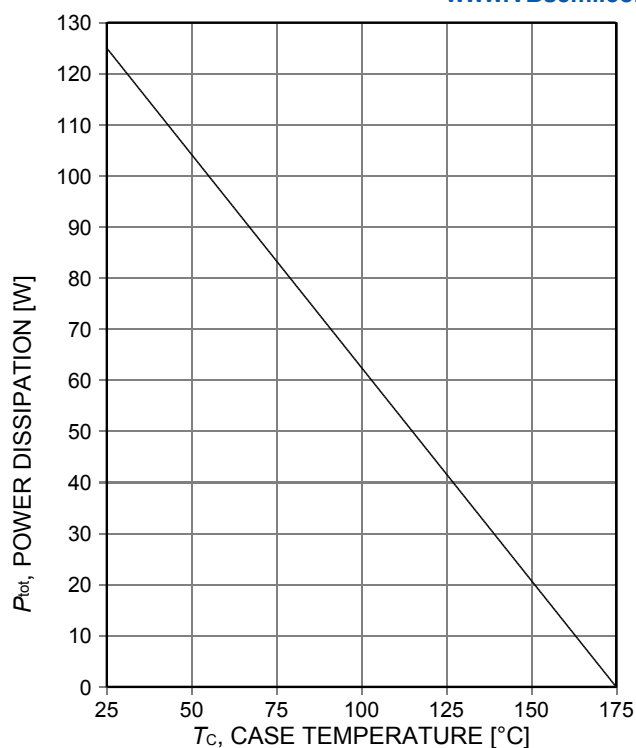


Figure 2. **Power dissipation as a function of case temperature**
 ($T_{vj}\leq 175^\circ\text{C}$)

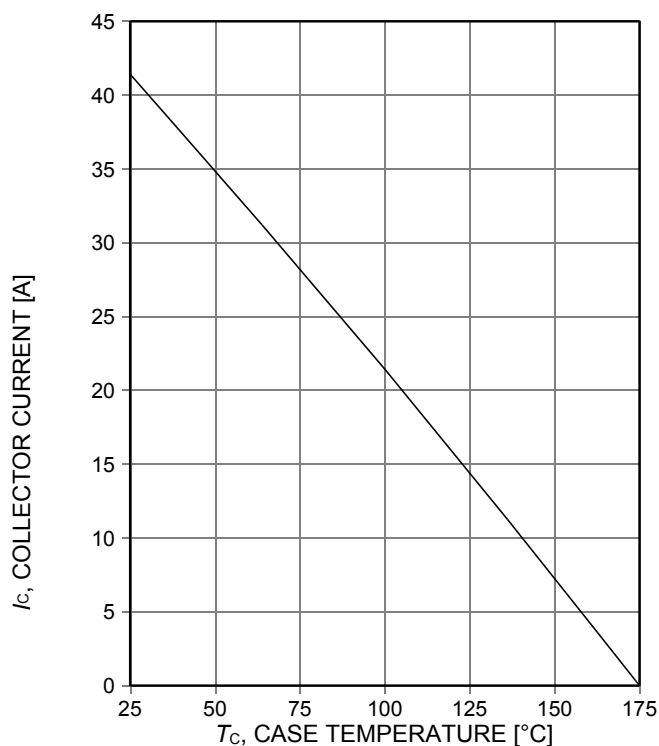


Figure 3. **Collector current as a function of case temperature**

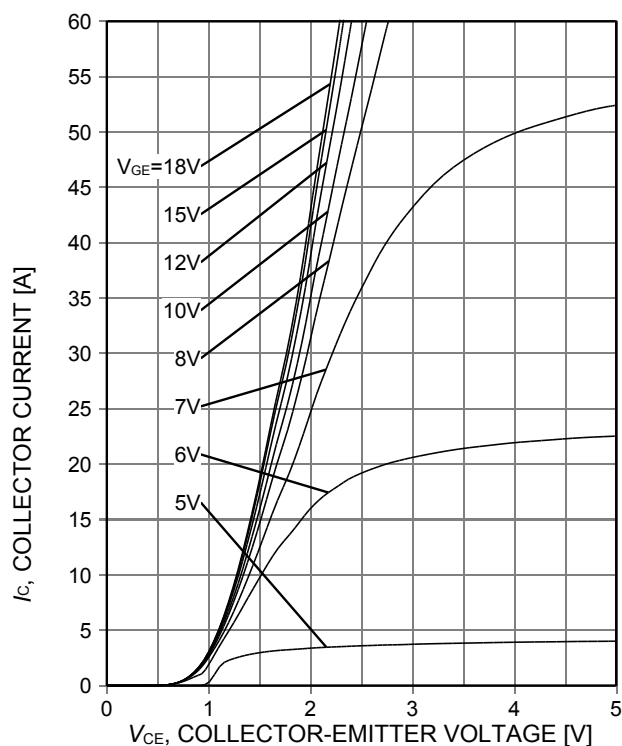


Figure 4. **Typical output characteristic**

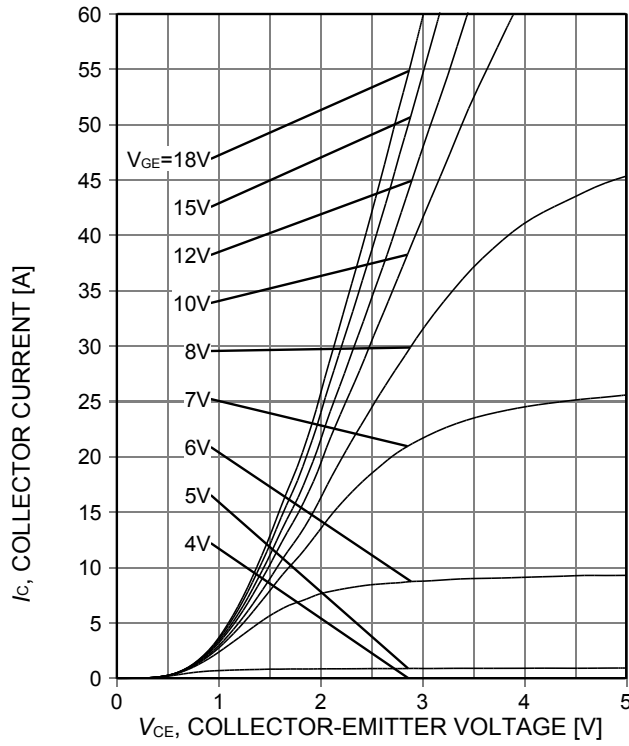


Figure 5. **Typical output characteristic**
($T_{vj}=150^{\circ}\text{C}$)

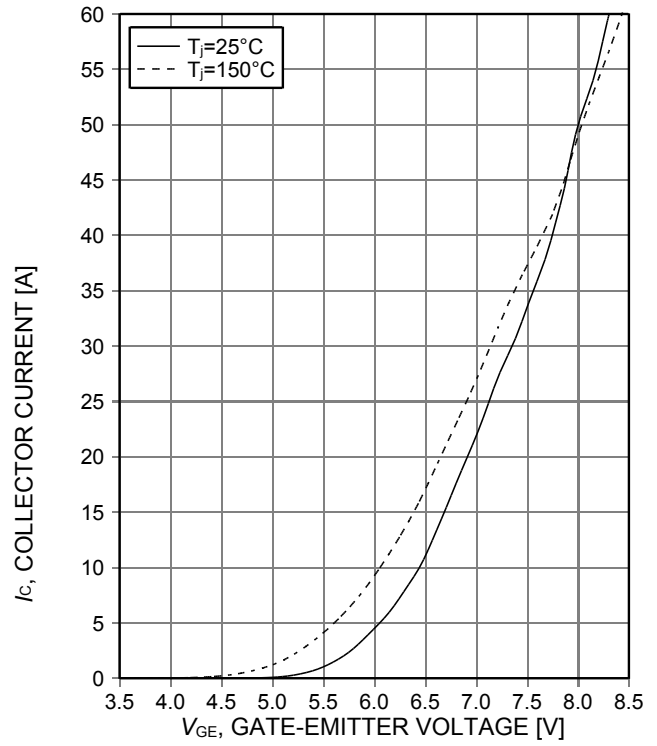


Figure 6. **Typical transfer characteristic**
($V_{ce}=20\text{V}$)

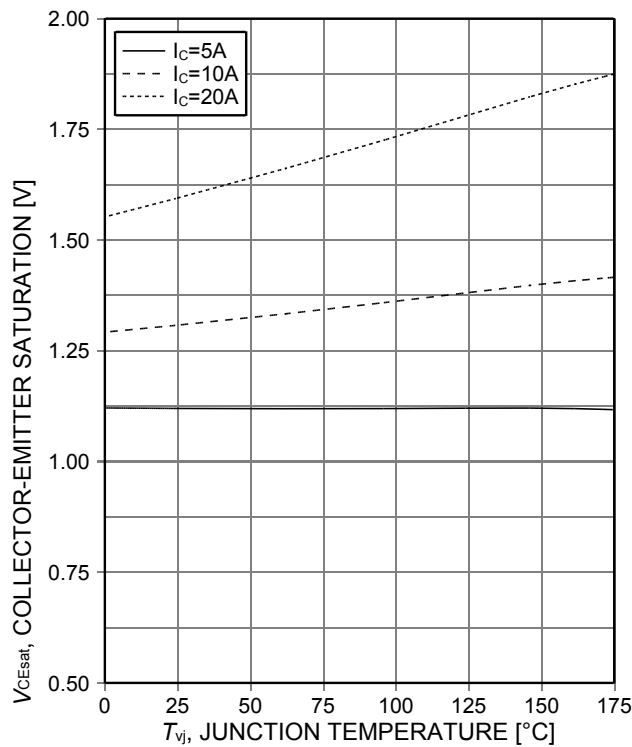


Figure 7. **Typical collector-emitter saturation voltage as a function of junction temperature**

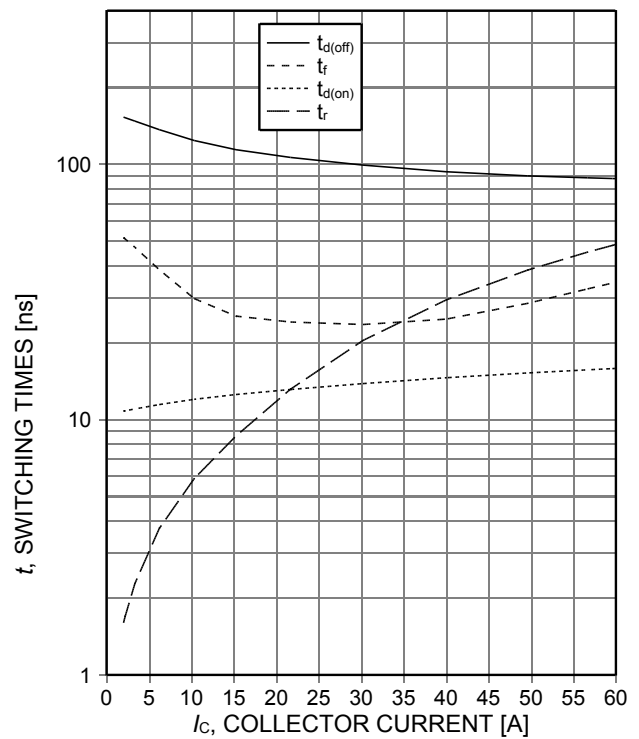


Figure 8. **Typical switching times as a function of collector current**

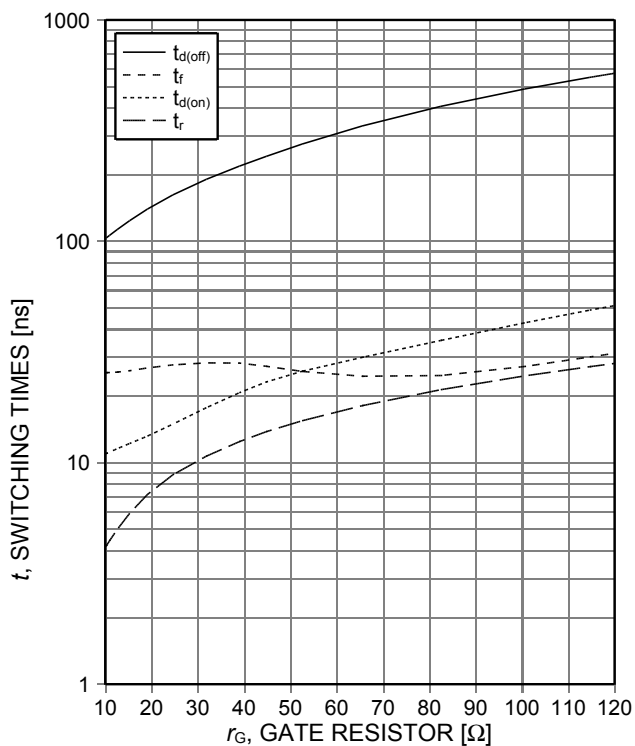


Figure 9. Typical switching times as a function of gate resistor

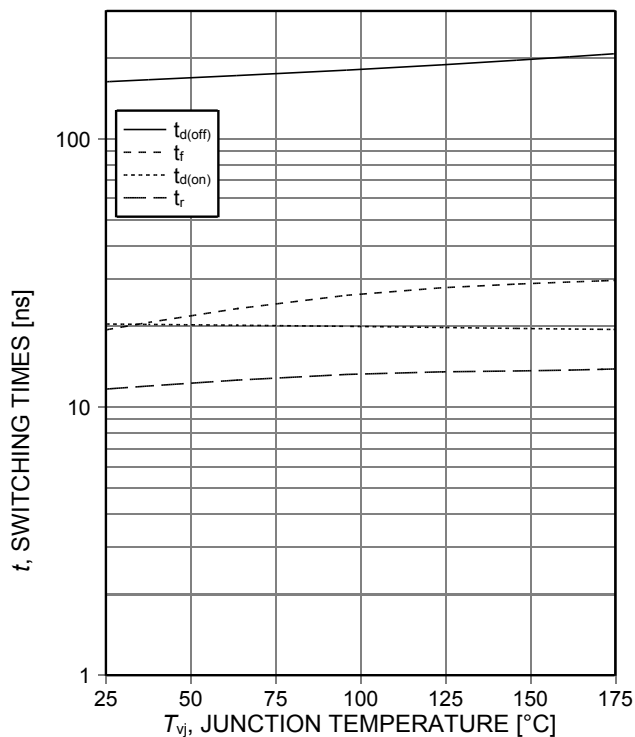


Figure 10. Typical switching times as a function of junction temperature

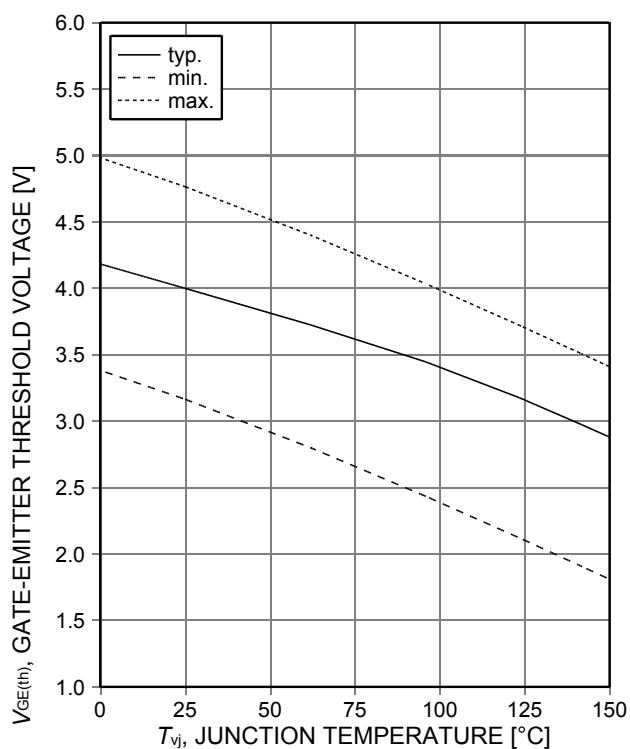


Figure 11. Gate-emitter threshold voltage as a function of junction temperature

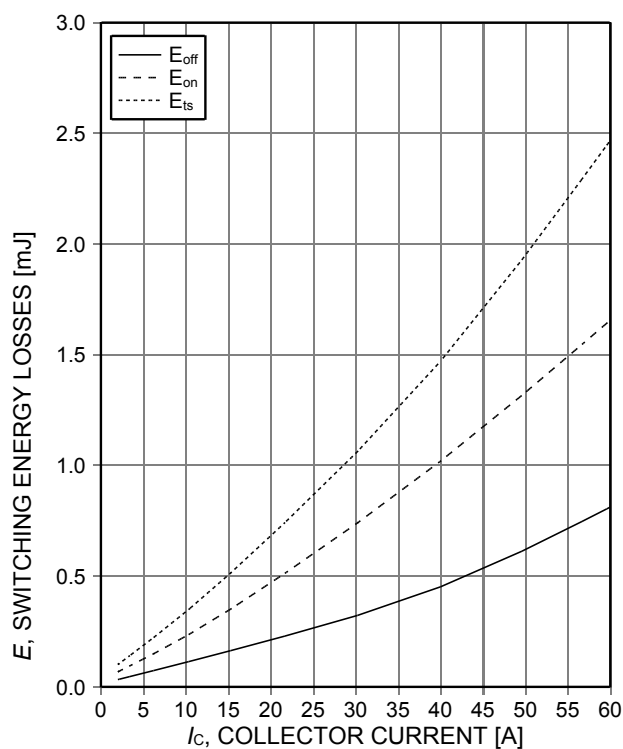


Figure 12. Typical switching energy losses as a function of collector current

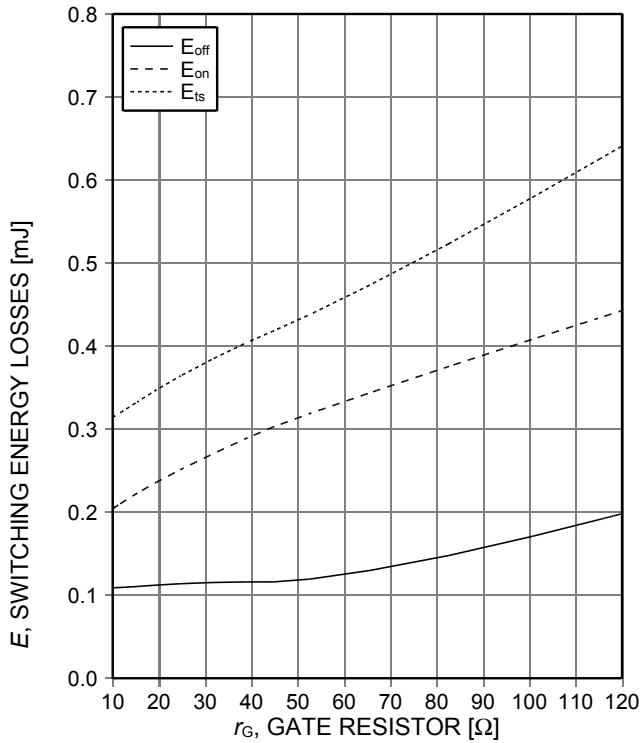


Figure 13. Typical switching energy losses as a function of gate resistor

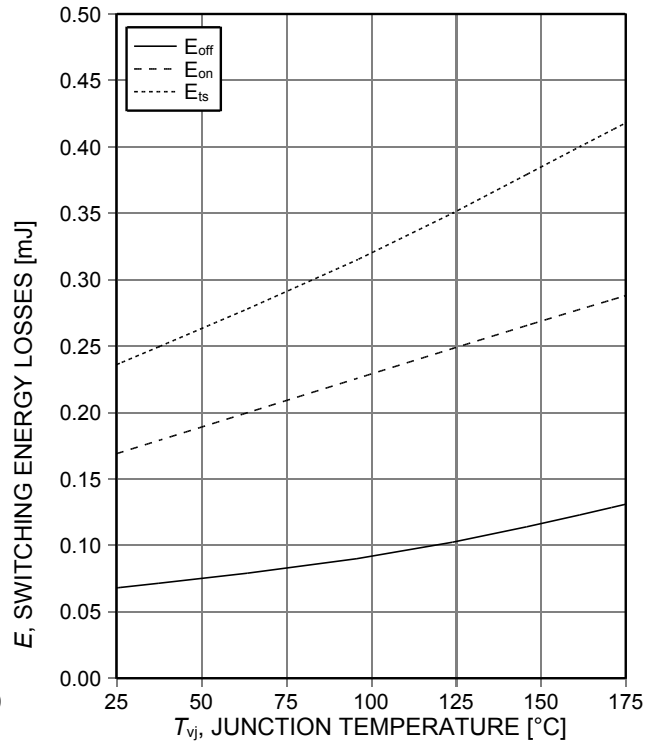


Figure 14. Typical switching energy losses as a function of junction temperature

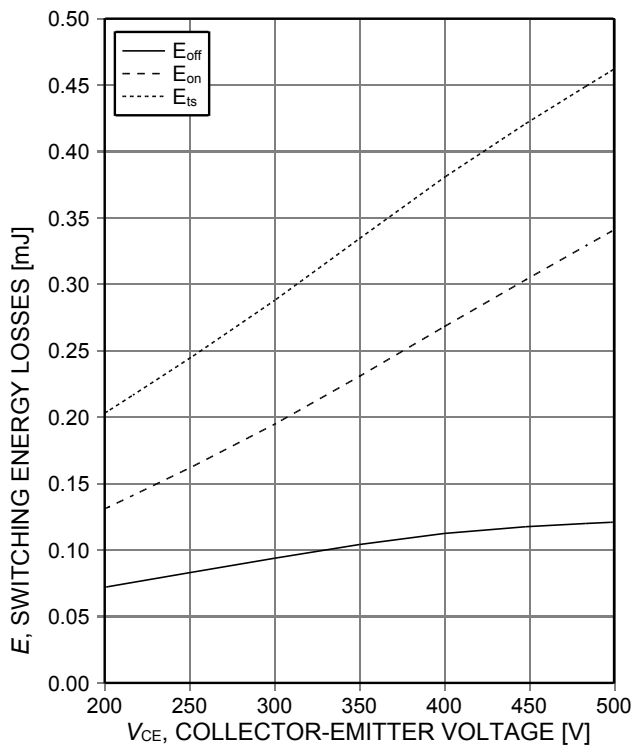


Figure 15. Typical switching energy losses as a function of collector emitter voltage

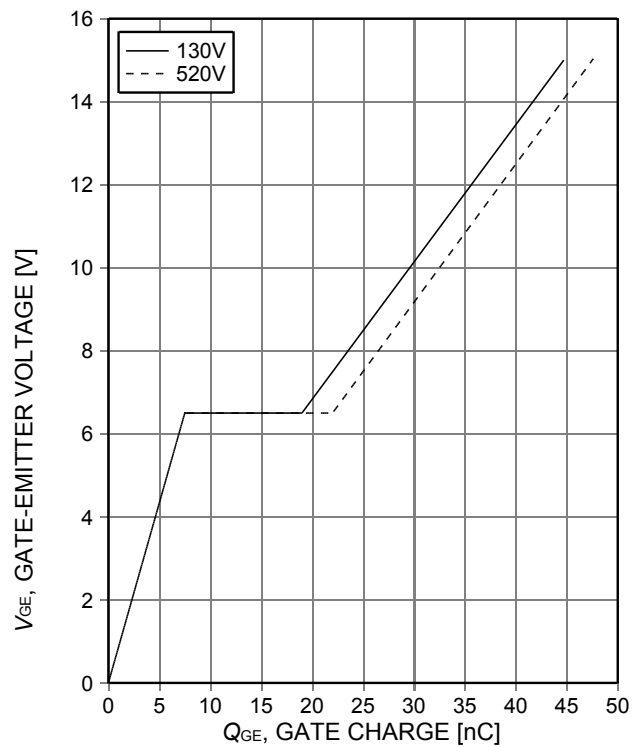


Figure 16. Typical gate charge

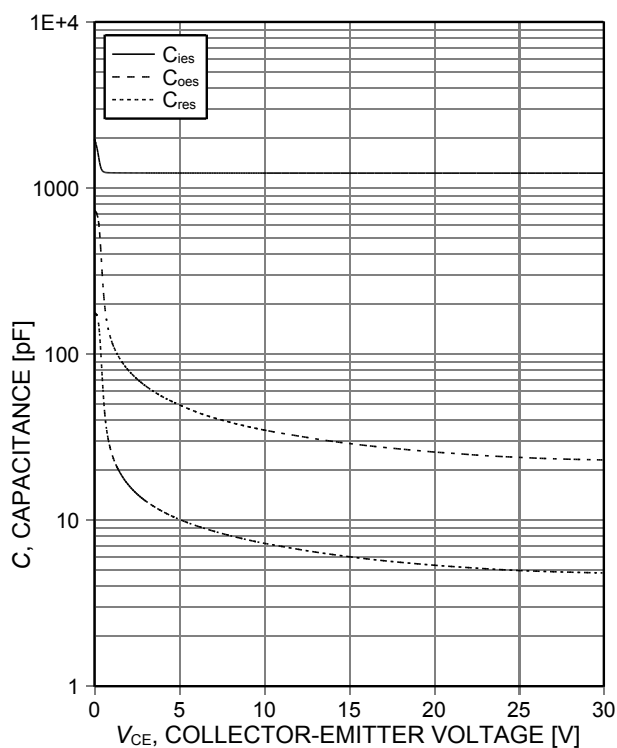


Figure 17. Typical capacitance as a function of collector-emitter voltage

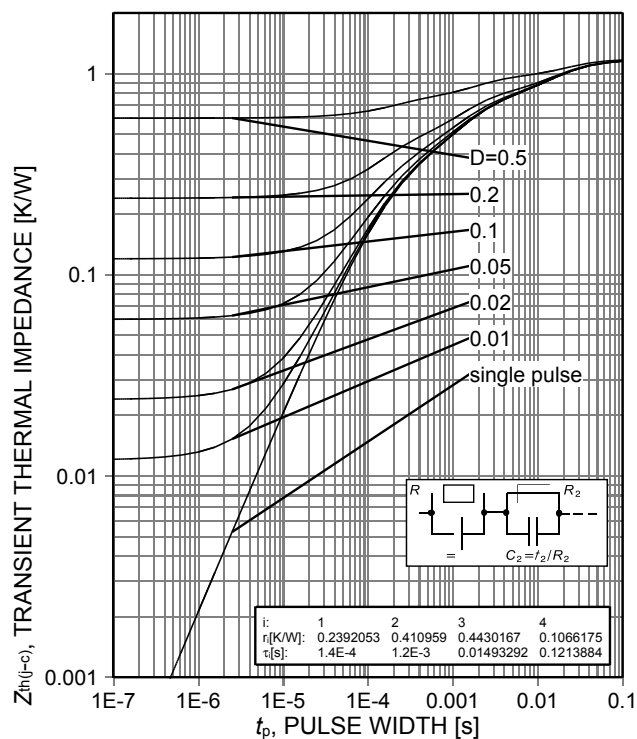


Figure 18. IGBT transient thermal impedance

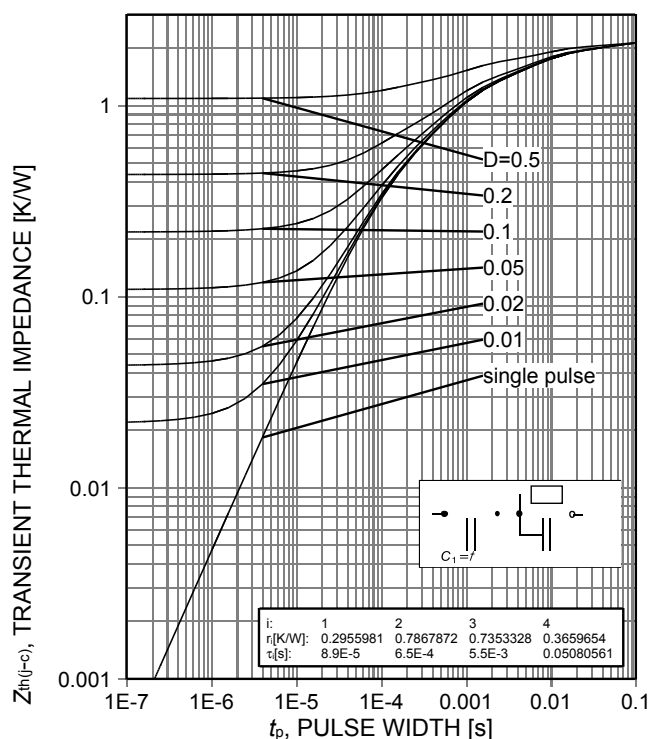


Figure 19. Diode transient thermal impedance as a function of pulse width

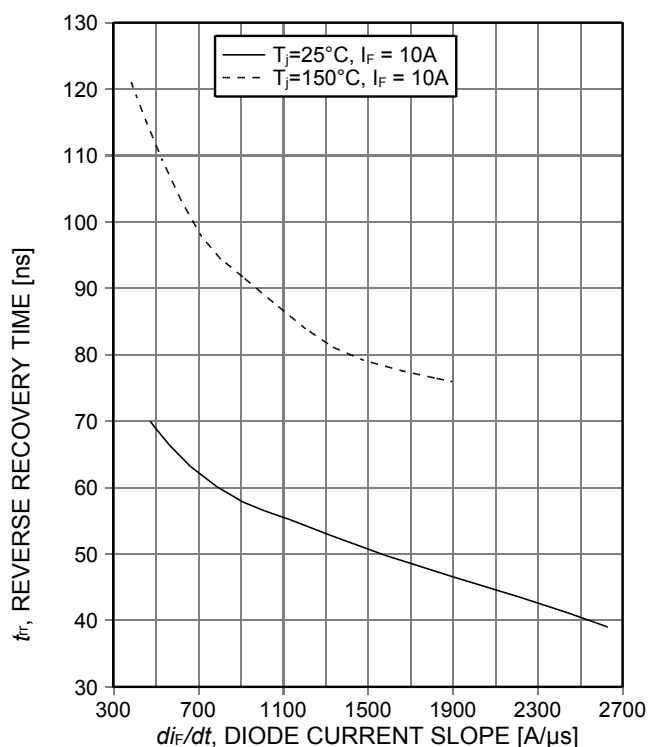
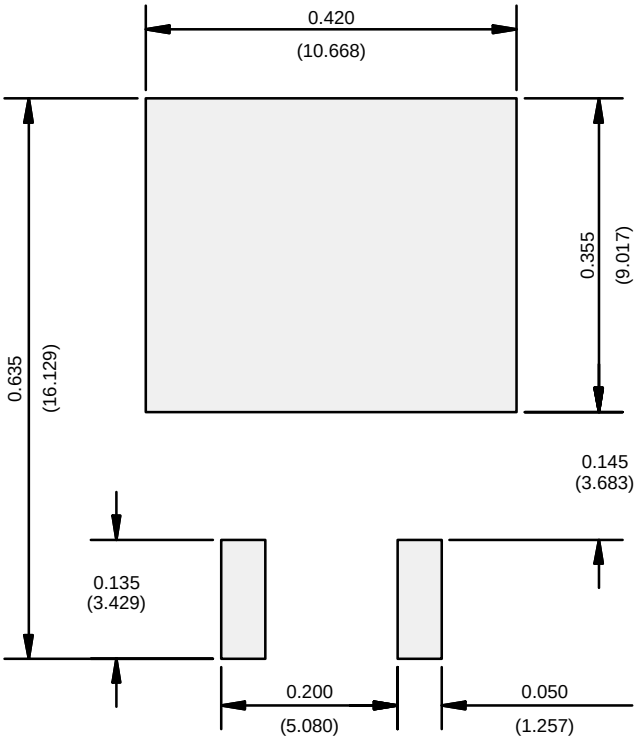
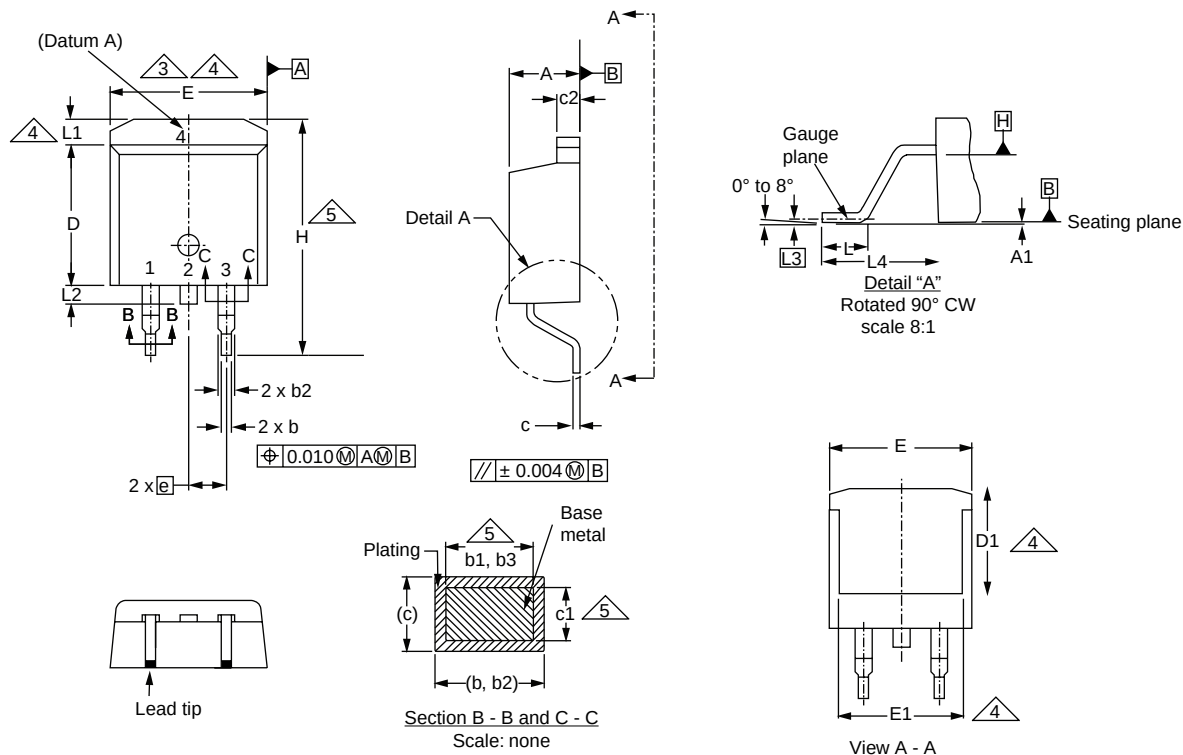


Figure 20. Typical reverse recovery time as a function of diode current slope

RECOMMENDED MINIMUM PADS FOR D²PAK: 3-Lead



Recommended Minimum Pads
Dimensions in Inches/(mm)

TO-263AB (HIGH VOLTAGE)

	MILLIMETERS		INCHES	
DIM.	MIN.	MAX.	MIN.	MAX.
A	4.06	4.83	0.160	0.190
A1	0.00	0.25	0.000	0.010
b	0.51	0.99	0.020	0.039
b1	0.51	0.89	0.020	0.035
b2	1.14	1.78	0.045	0.070
b3	1.14	1.73	0.045	0.068
c	0.38	0.74	0.015	0.029
c1	0.38	0.58	0.015	0.023
c2	1.14	1.65	0.045	0.065
D	8.38	9.65	0.330	0.380

	MILLIMETERS		INCHES	
DIM.	MIN.	MAX.	MIN.	MAX.
D1	6.86	-	0.270	-
E	9.65	10.67	0.380	0.420
E1	6.22	-	0.245	-
e	2.54 BSC		0.100 BSC	
H	14.61	15.88	0.575	0.625
L	1.78	2.79	0.070	0.110
L1	-	1.65	-	0.066
L2	-	1.78	-	0.070
L3	0.25 BSC		0.010 BSC	
L4	4.78	5.28	0.188	0.208

Notes

1. Dimensioning and tolerancing per ASME Y14.5M-1994.
2. Dimensions are shown in millimeters (inches).
3. Dimension D and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outmost extremes of the plastic body at datum A.
4. Thermal PAD contour optional within dimension E, L1, D1 and E1.
5. Dimension b1 and c1 apply to base metal only.
6. Datum A and B to be determined at datum plane H.
7. Outline conforms to JEDEC outline to TO-263AB.

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