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تهران، پاساژ امجد، طبقه اول، واحد ۱۶



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maspower

MSG40T120FH

High speed Trench Fieldstop IGBT

General Description

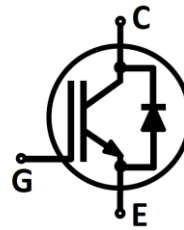
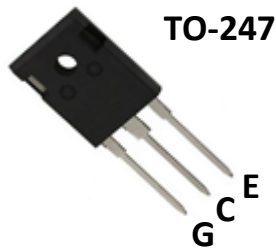
This IGBT is produced using advanced trench fieldstop IGBT technology, which provides low $V_{CE(sat)}$, high switching performance and excellent quality.

Features

- High Speed Switching
- Positive Temperature coefficient for easy paralleling
- High ruggedness&good thermal stability
- Including fast free-wheeling diode
- Very tight parameter distribution

Applications

- Welding



Absolute Maximum Ratings

Characteristics	Symbol	Rating	Unit	
Collector-emitter voltage	V_{CE}	1200	V	
Gate-emitter voltage	V_{GE}	±20	V	
Collector current	I_C	$T_C=25^{\circ}C$	80	A
		$T_C=100^{\circ}C$	40	
Pulsed collector current, t_p limited by T_{jmax}	I_{CM}	120	A	
Diode forward current @ $T_C=100^{\circ}C$	I_F	40	A	
Diode pulsed collector current, t_p limited by T_{jmax}	I_{FM}	120	A	
Short circuit withstand time $V_{GE}=15V, V_{CC}=600V, T_j=25^{\circ}C$ Allowed number of short circuit < 1000 Time between short circuits $\geq 1.0s$	t_{SC}	3	μs	
Power dissipation	P_{tot}	$T_C=25^{\circ}C$	312	W
		$T_C=100^{\circ}C$	125	
Operating junction temperature	T_j	-55~150	$^{\circ}C$	
Storage temperature	T_{stg}	-55~150		

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Thermal Characteristics

Characteristics	Symbol	Rating	Unit
Thermal resistance junction-to-case for IGBT	R_{thJC}	0.40	°C/W
Thermal resistance junction-to-case for Diode	R_{thJCD}	1.2	
Thermal resistance junction-to-ambient	R_{thJA}	40	

Electrical Characteristics ($T_j = 25^\circ\text{C}$ unless otherwise specified)

Characteristics	Symbol	Test Condition	Min	Typ	Max	Unit
Static Characteristics						
Collector-emitter breakdown voltage	BV_{CES}	$V_{GE}=0V, I_C=0.5mA$	1200	-	-	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	$V_{GE}=15V, I_C=40A$ $T_j=25^\circ\text{C}$ $T_j=150^\circ\text{C}$	- - -	2.2 3.1	2.7 -	
Gate-emitter threshold voltage	$V_{GE(th)}$	$I_C=1.5mA, V_{CE}=V_{GE}$	5	5.8	6.5	
Zero gate voltage collector current	I_{CES}	$V_{CE}=1200V, V_{GE}=0V$ $T_j=25^\circ\text{C}$ $T_j=150^\circ\text{C}$	- -	- -	0.1 4	mA
Gate-emitter leakage current	I_{GES}	$V_{CE}=0V, V_{GE}=20V$	-	-	200	nA
Transconductance	g_{FS}	$V_{CE}=20V, I_C=40A$	-	43	-	S
Dynamic Characteristics						
Input capacitance	C_{iss}	$V_{CE}=25V$	-	6800	-	pF
Output capacitance	C_{oss}	$V_{GE}=0V$	-	200	-	
Reverse transfer capacitance	C_{rss}	$f=1MHz$	-	60	-	
Gate charge	Q_G	$V_{CC}=600V, I_C=40A$ $V_{GE}=15V$	-	240	-	nC

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Characteristics	Symbol	Test Condition	Min	Typ	Max	Unit
Switching Characteristics						
Turn-on delay time	$t_{d(on)}$	$T_j=25^\circ\text{C}$ $V_{CC}=600\text{V}$ $I_C=40\text{A}$ $V_{GE}=15/0\text{V}$ $R_G=12\Omega$ $L_{load}=500\mu\text{H}$	-	73	-	ns
Rise time	t_r		-	81	-	
Turn-off delay time	$t_{d(off)}$		-	284	-	
Fall time	t_f		-	47	-	
Turn-on switching energy	E_{on}	$T_j=150^\circ\text{C}$ $V_{CC}=600\text{V}$ $I_C=40\text{A}$ $V_{GE}=15/0\text{V}$ $R_G=12\Omega$ $L_{load}=500\mu\text{H}$	-	2.5	-	mJ
Turn-off switching energy	E_{off}		-	1.4	-	
Total switching energy	E_{ts}		-	3.9	-	
Turn-on delay time	$t_{d(on)}$	$T_j=150^\circ\text{C}$ $V_{CC}=600\text{V}$ $I_C=40\text{A}$ $V_{GE}=15/0\text{V}$ $R_G=12\Omega$ $L_{load}=500\mu\text{H}$	-	65	-	ns
Rise time	t_r		-	75	-	
Turn-off delay time	$t_{d(off)}$		-	316	-	
Fall time	t_f		-	75	-	
Turn-on switching energy	E_{on}	$T_j=150^\circ\text{C}$ $V_{CC}=600\text{V}$ $I_C=40\text{A}$ $V_{GE}=15/0\text{V}$ $R_G=12\Omega$ $L_{load}=500\mu\text{H}$	-	2.4	-	mJ
Turn-off switching energy	E_{off}		-	1.8	-	
Total switching energy	E_{ts}		-	4.2	-	
Diode Characteristics						
Forward voltage	V_F	$I_F=40\text{A}, T_j=25^\circ\text{C}$	-	2.3	2.5	V
		$I_F=40\text{A}, T_j=150^\circ\text{C}$	-	2.1	-	
Reverse recovery time	t_{rr}	$T_j=25^\circ\text{C}$ $V_R=600\text{V}, I_F=40\text{A}$ $di_F/dt=500\text{A}/\mu\text{s}$	-	140	-	ns
Reverse recovery charge	Q_{rr}		-	2.2	-	μC
Reverse recovery current	I_{rrm}		-	29	-	A
Reverse recovery time	t_{rr}	$T_j=150^\circ\text{C}$ $V_R=600\text{V}, I_F=40\text{A}$ $di_F/dt=500\text{A}/\mu\text{s}$	-	180	-	ns
Reverse recovery charge	Q_{rr}		-	3.6	-	μC
Reverse recovery current	I_{rrm}		-	35	-	A

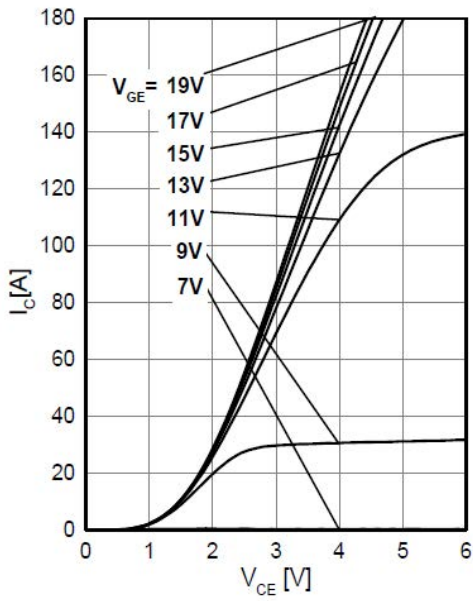


Figure 1. Typical output characteristic ($I_c=f(V_{CE})$, $T_j= 25^\circ\text{C}$)

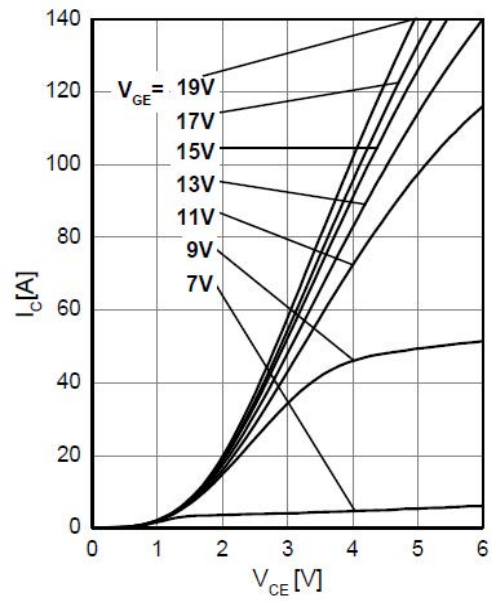


Figure 2. Typical output characteristic ($I_c=f(V_{CE})$, $T_j= 150^\circ\text{C}$)

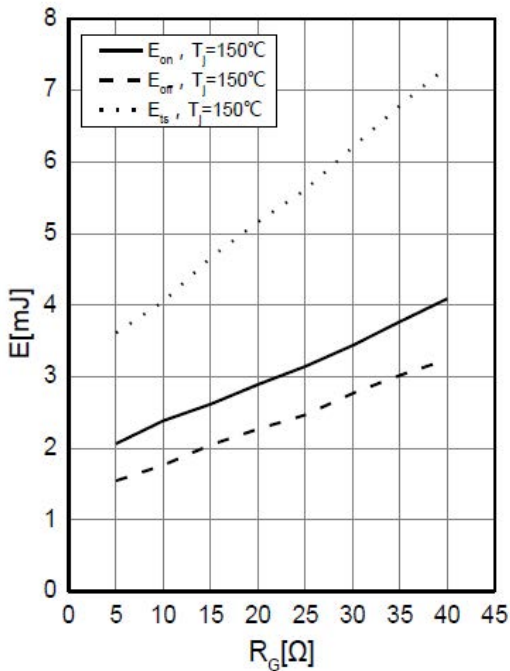


Figure 3. Typical switching energy losses as a function of gate resistor (inductive load, $V_{CC}=600\text{V}$, $V_{GE}=0/15\text{V}$, $I_c=40\text{A}$ Dynamic test circuit in Figure D)

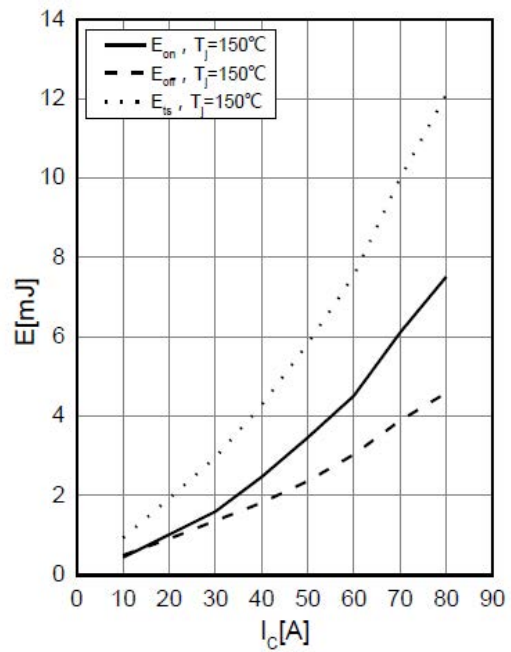


Figure 4. Typical switching energy losses as a function of collector current (inductive load, $V_{CE}=600\text{V}$, $V_{GE}=0/15\text{V}$, $R_G=12\Omega$, Dynamic test circuit in Figure D)

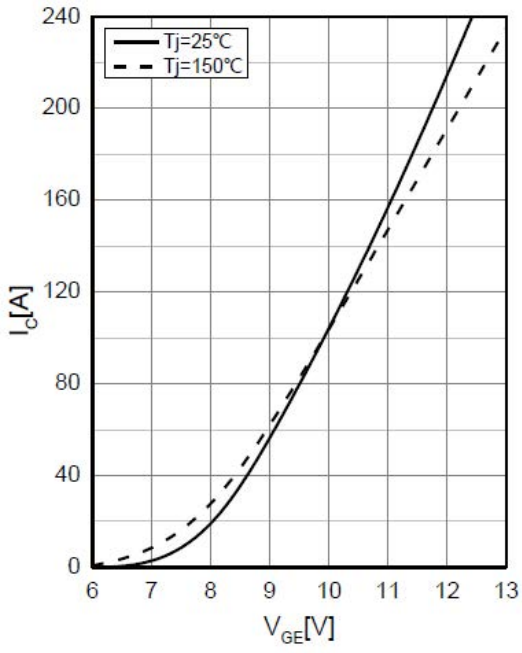


Figure 4. Typical transfer characteristic ($I_C=f(V_{GE}), V_{CE}=20V$)

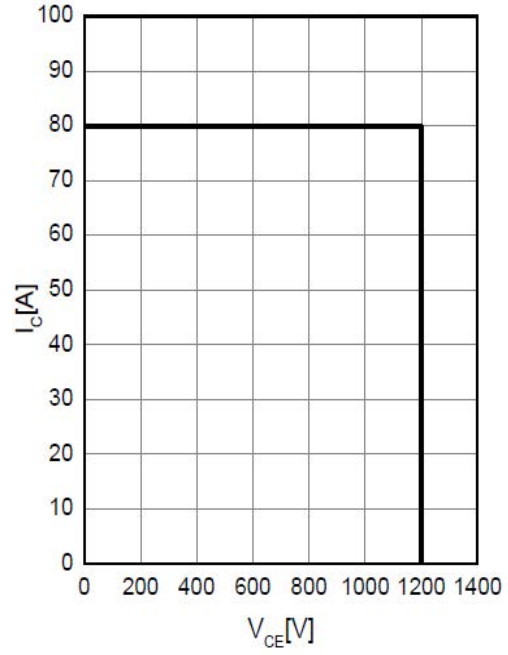


Figure 6. Reverse bias safe operating area ($T_j = 150^\circ C$)

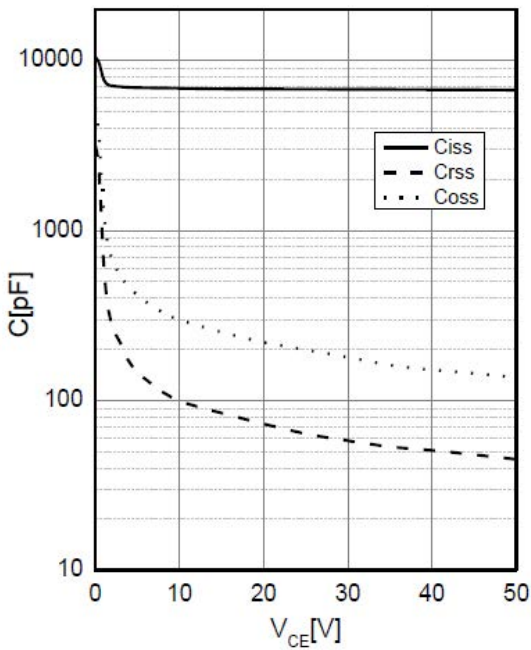


Figure 7. Typical capacitance characteristic ($V_{GE}=0V, f = 1 MHz$)

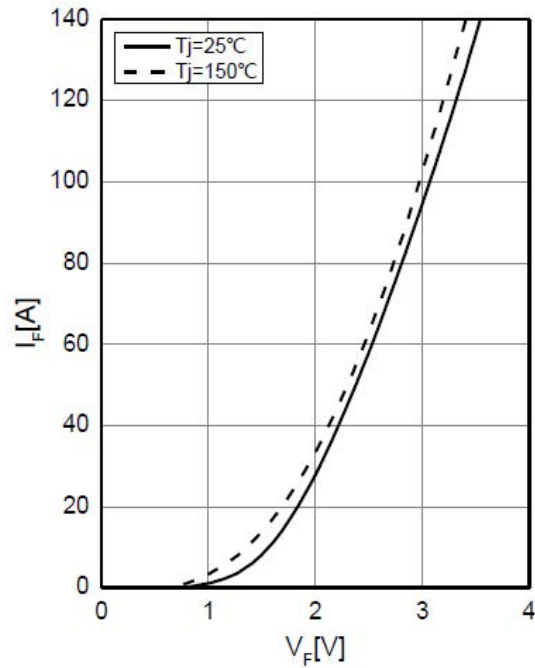


Figure 8. Typical forward characteristic of Diode ($I_F=f(V_F)$)

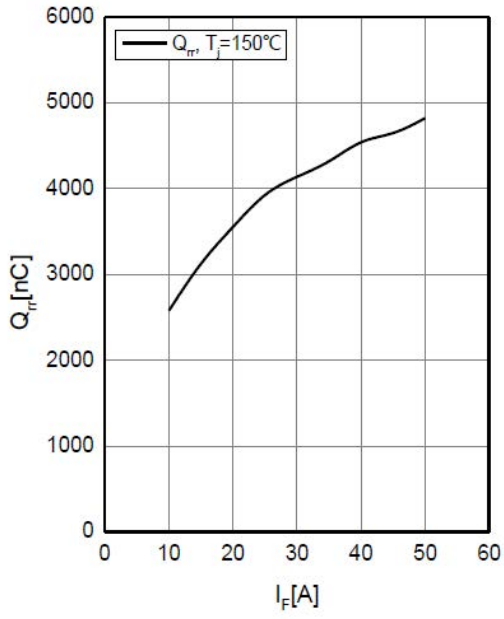


Figure 9. Typical reverse recovery charge ($Q_{rr}=f(I_F)$, $R_G=10\Omega$, $V_{CE}=600\text{V}$)

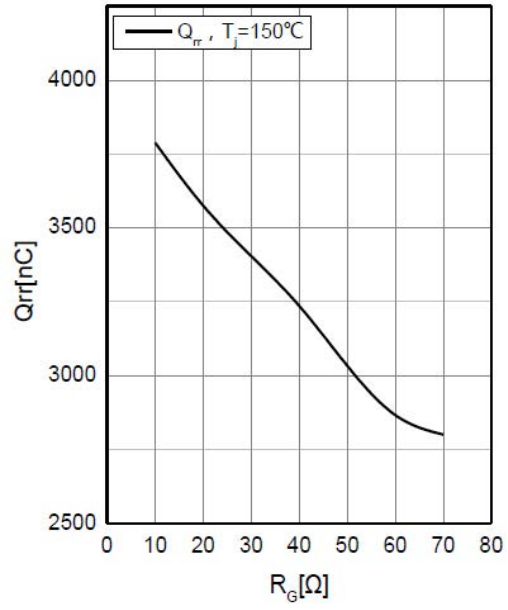


Figure 10. Typical reverse recovery charge ($Q_{rr}=f(I_F)$, $I_F=25\text{A}$, $V_{CE}=600\text{V}$)

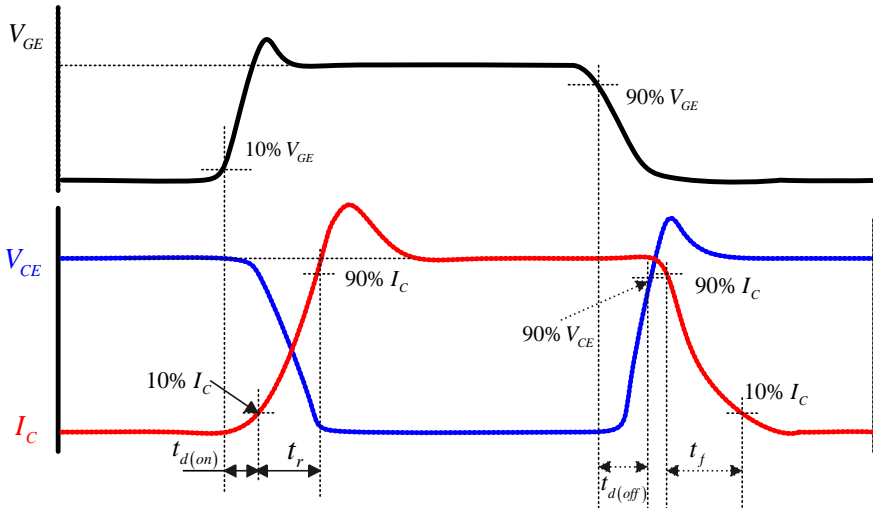


Figure A. Definition of switching times

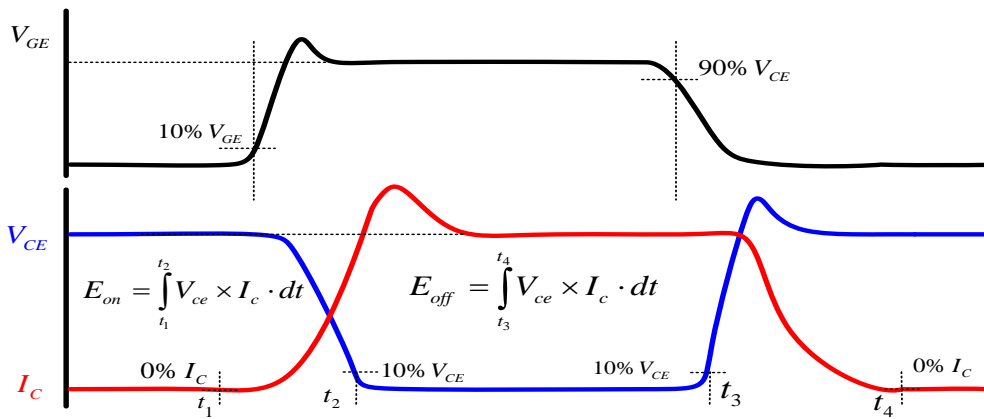


Figure B. Definition of switching losses

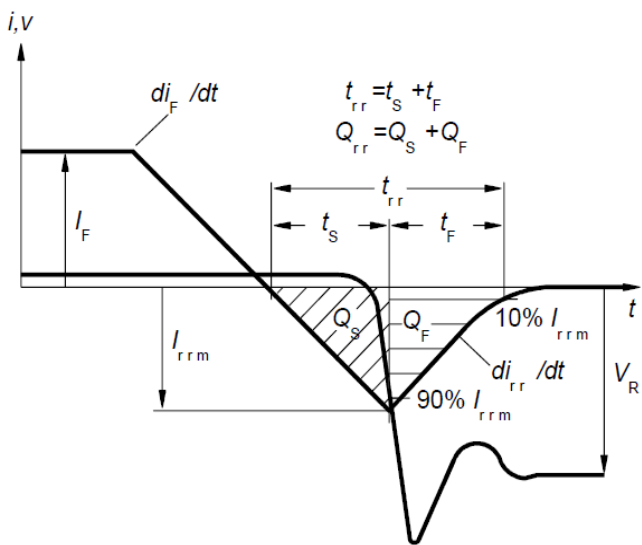


Figure C. Definition of diodes switching characteristics

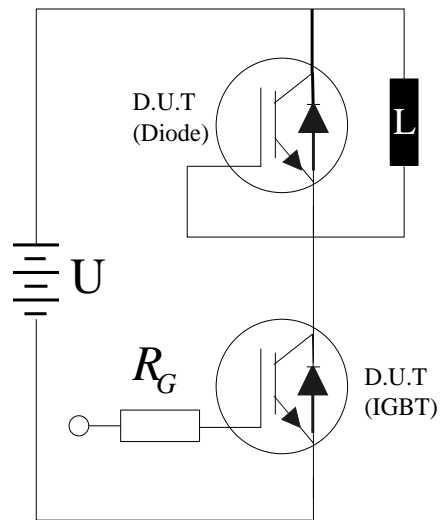
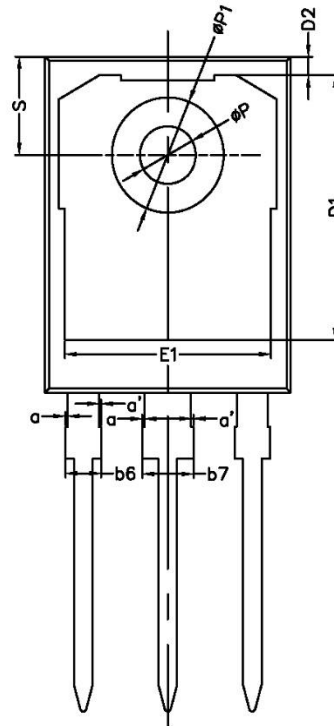
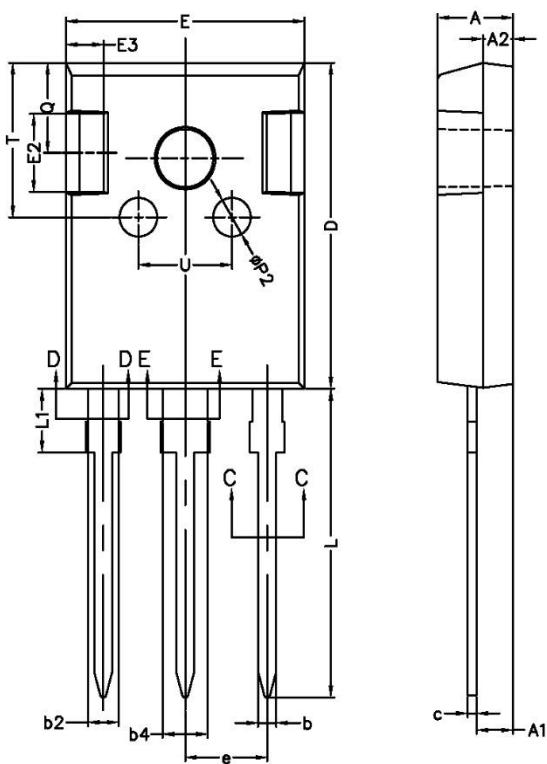


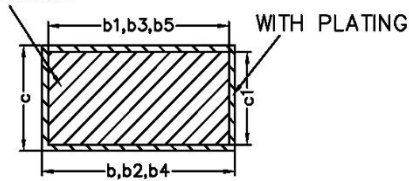
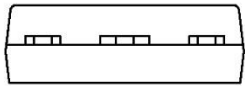
Figure D. Dynamic test circuit

TO-247



BASE METAL

WITH PLATING



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	4.90	5.00	5.10
A1	2.31	2.41	2.51
A2	1.90	2.00	2.10
a	0	-	0.15
a'	0	-	0.15
b	1.16	-	1.26
b1	1.15	1.2	1.22
b2	1.96	-	2.06
b3	1.95	2.00	2.02
b4	2.96	-	3.06
b5	2.95	3.00	3.02
b6	-	-	2.25
b7	-	-	3.25
c	0.59	-	0.66
c1	0.58	0.60	0.62
D	20.90	21.00	21.10
D1	16.25	16.55	16.85
D2	1.05	1.20	1.35
E	15.70	15.80	15.90
E1	13.10	13.30	13.50
E2	4.90	5.00	5.10
E3	2.40	2.50	2.60
e	5.34	5.44	5.54
L	19.80	19.92	20.10
L1	-	-	4.30
P	3.50	3.60	3.70
P1	-	-	7.40
P2	2.40	2.50	2.60
Q	5.60	-	6.00
S	6.05	6.15	6.25
T	9.80	-	10.20
U	6.00	-	6.40

NOTES:
1. ALL DIMENSIONS REFER TO JEDEC STANDARD TO-247 AD DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.
2. EJECTION MARK DEPTH 0.10 ± 0.05