

## P-Channel 60 V (D-S) MOSFET

PRODUCT SUMMARY		
V <sub>DS</sub> (V)	R <sub>DS(on)</sub> (Ω)	I <sub>D</sub> (A) <sup>d</sup>
-60	0.0037 at V <sub>GS</sub> = -10 V	-140
	0.0046 at V <sub>GS</sub> = -4.5 V	

### FEATURES

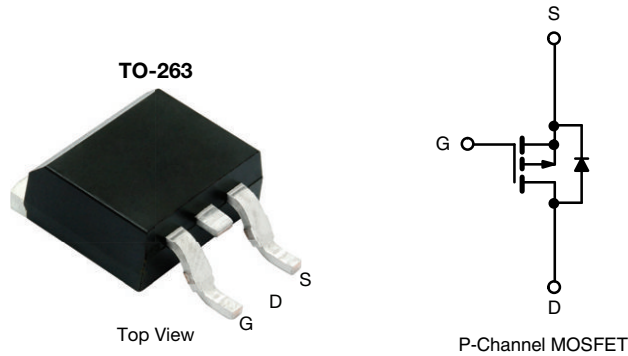
- DT-Trench Power MOSFET
- 100 % R<sub>g</sub> and UIS Tested



**RoHS**  
COMPLIANT

### APPLICATIONS

- Power Switch
- DC/DC Converters
- Portable equipment and battery powered systems



ABSOLUTE MAXIMUM RATINGS (T <sub>C</sub> = 25 °C, unless otherwise noted)				
PARAMETER		SYMBOL	LIMIT	UNIT
Drain-Source Voltage		V <sub>DS</sub>	-60	V
Gate-Source Voltage		V <sub>GS</sub>	± 20	
Continuous Drain Current <sup>d</sup> (T <sub>J</sub> = 175 °C)	T <sub>C</sub> = 25 °C	I <sub>D</sub>	-140	A
	T <sub>C</sub> = 125 °C		-89	
Pulsed Drain Current		I <sub>DM</sub>	-550	
Avalanche Current	L = 0.1 mH	I <sub>AS</sub>	-108	
Single Pulse Avalanche Energy <sup>a</sup>		E <sub>AS</sub>	505	mJ
Power Dissipation	T <sub>C</sub> = 25 °C <sup>c</sup>	P <sub>D</sub>	195	W
	T <sub>A</sub> = 25 °C <sup>b</sup>		4.37	
Operating Junction and Storage Temperature Range		T <sub>J</sub> , T <sub>stg</sub>	-55 to +175	°C

THERMAL RESISTANCE RATINGS				
PARAMETER		SYMBOL	TYPICAL	UNIT
Junction-to-Ambient	PCB mount <sup>b</sup>	R <sub>thJA</sub>	40	°C/W
Junction-to-Case		R <sub>thJC</sub>	0.4	

### Notes

- Duty cycle ≤ 1 %.
- When mounted on 1" square PCB (FR4 material).
- See SOA curve for voltage derating.
- Limited by package.

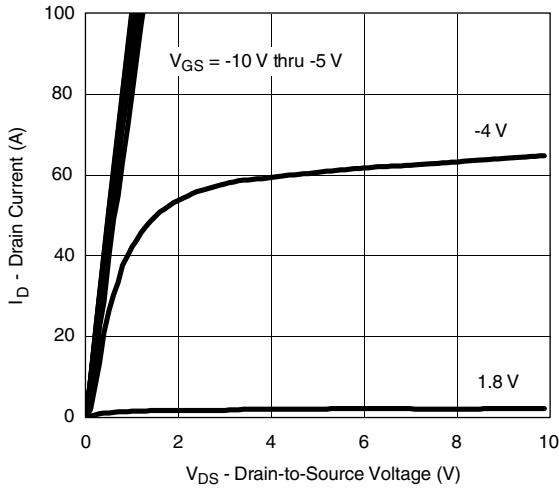
SPECIFICATIONS (T <sub>J</sub> = 25 °C, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Static</b>						
Drain-Source Breakdown Voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = -250 μA	-60	-	-	V
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250 μA	-1	-	-3	
Gate-Body Leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 20 V	-	-	± 100	nA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = -60 V, V <sub>GS</sub> = 0 V	-	-	-1	μA
		V <sub>DS</sub> = -48 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125 °C	-	-	-10	
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>DS</sub> = -5 V, V <sub>GS</sub> = -10 V	-140	-	-	A
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = -10 V, I <sub>D</sub> = -50 A	-	0.0037	0.0046	Ω
		V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -25 A	-	0.0046	0.0062	
Forward Transconductance <sup>a</sup>	g <sub>fs</sub>	V <sub>DS</sub> = -15 V, I <sub>D</sub> = -10 A	-	20	-	S
<b>Dynamic <sup>b</sup></b>						
Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = -30 V, f = 1 MHz	-	18800	-	pF
Output Capacitance	C <sub>oss</sub>		-	1750	-	
Reverse Transfer Capacitance	C <sub>rss</sub>		-	725	-	
Total Gate Charge <sup>c</sup>	Q <sub>g</sub>	V <sub>DS</sub> = -30 V, V <sub>GS</sub> = -10 V, I <sub>D</sub> = -10 A	-	230	545	nC
Gate-Source Charge <sup>c</sup>	Q <sub>gs</sub>		-	50	-	
Gate-Drain Charge <sup>c</sup>	Q <sub>gd</sub>		-	25	-	
Gate Resistance	R <sub>g</sub>	f = 1 MHz	-	3	-	Ω
Turn-On Delay Time <sup>c</sup>	t <sub>d(on)</sub>	V <sub>DD</sub> = -30 V, R <sub>L</sub> = 0.27 Ω I <sub>D</sub> ≅ -110 A, V <sub>GEN</sub> = -10 V, R <sub>g</sub> = 1 Ω	-	81	125	ns
Rise Time <sup>c</sup>	t <sub>r</sub>		-	242	381	
Turn-Off Delay Time <sup>c</sup>	t <sub>d(off)</sub>		-	510	703	
Fall Time <sup>c</sup>	t <sub>f</sub>		-	240	362	
<b>Drain-Source Body Diode Characteristics (T<sub>C</sub> = 25 °C <sup>b</sup>)</b>						
Continuous Current	I <sub>S</sub>		-	-	-140	A
Pulsed Current	I <sub>SM</sub>		-	-	-550	
Forward Voltage <sup>a</sup>	V <sub>SD</sub>	I <sub>F</sub> = -85 A, V <sub>GS</sub> = 0 V	-	-0.7	-1.2	V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = -85 A, di/dt = 100 A/μs	-	41	-	ns
Reverse Recovery Charge	Q <sub>rr</sub>		-	0.21	0.44	μC

**Notes**

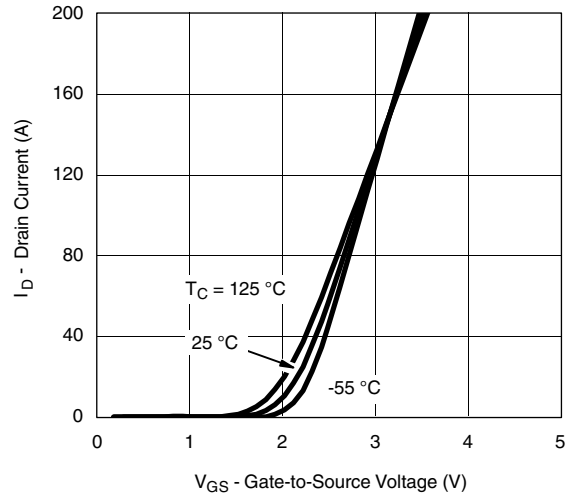
- Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %.
- Guaranteed by design, not subject to production testing.
- Independent of operating temperature.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

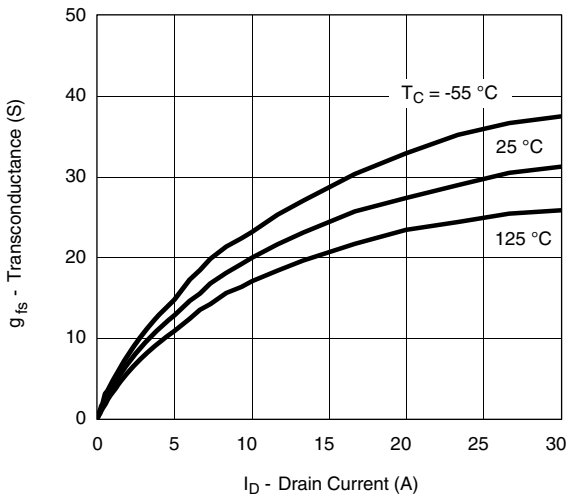
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



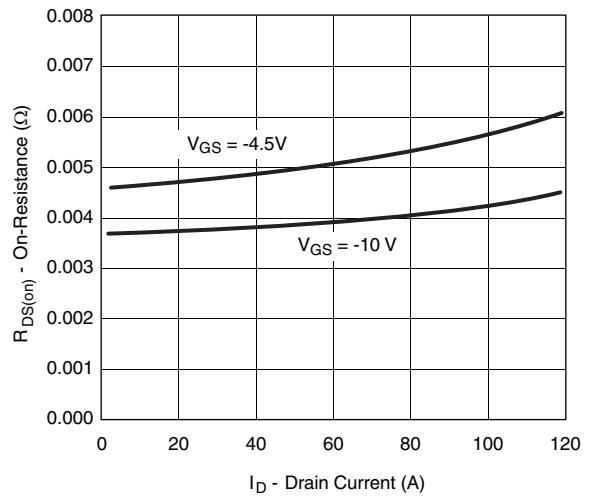
**Output Characteristics**



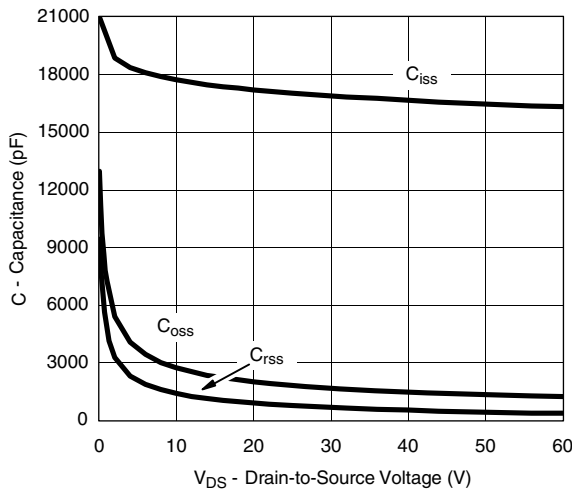
**Transfer Characteristics**



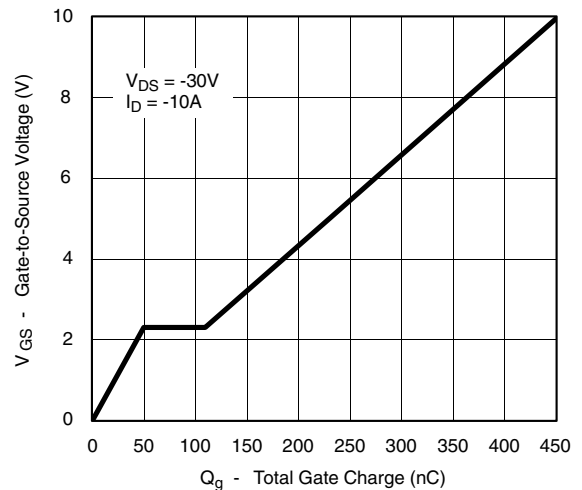
**Transconductance**



**On-Resistance vs. Drain Current**

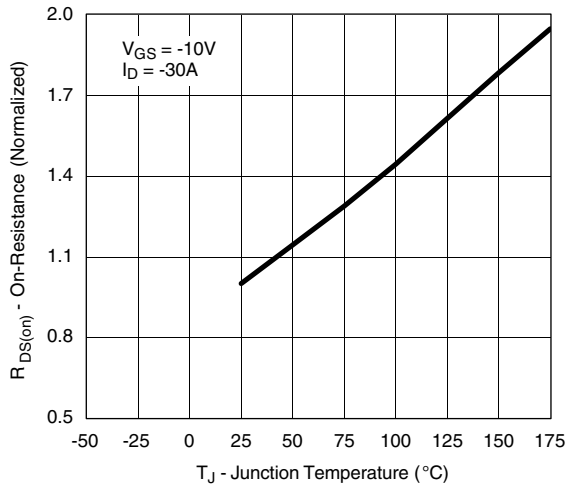


**Capacitance**

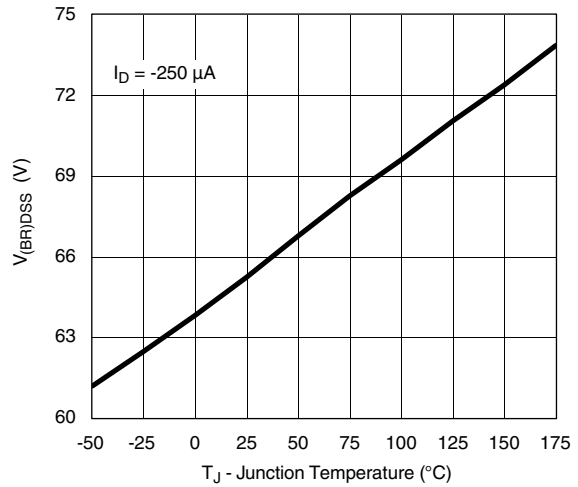


**Gate Charge**

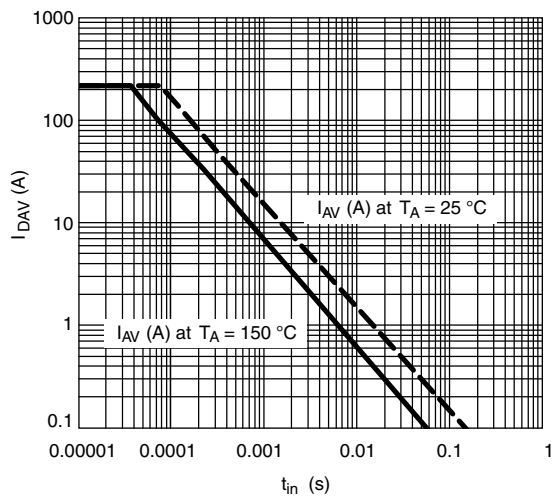
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



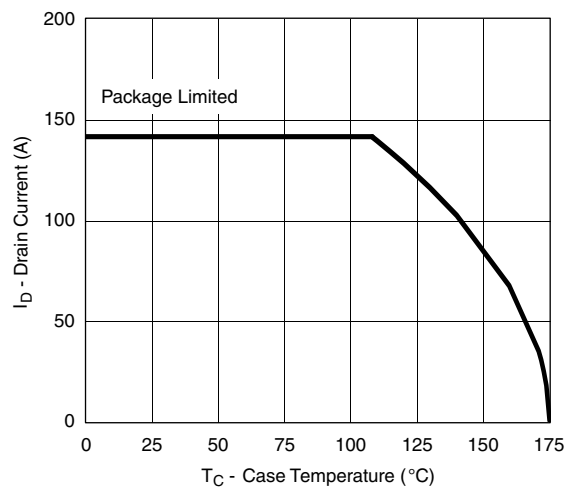
**On-Resistance vs. Junction Temperature**



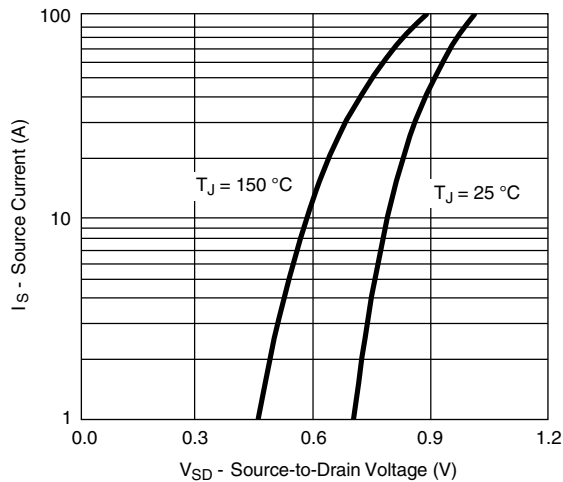
**Drain Source Breakdown vs. Junction Temperature**



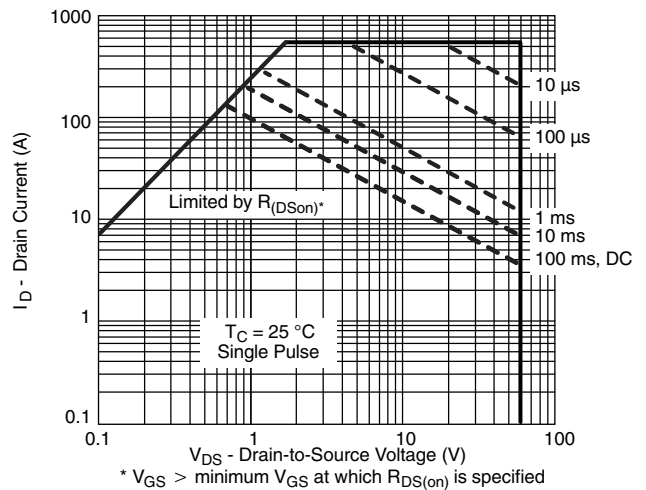
**Avalanche Current vs. Time**



**Maximum Avalanche and Drain Current vs. Case Temperature**

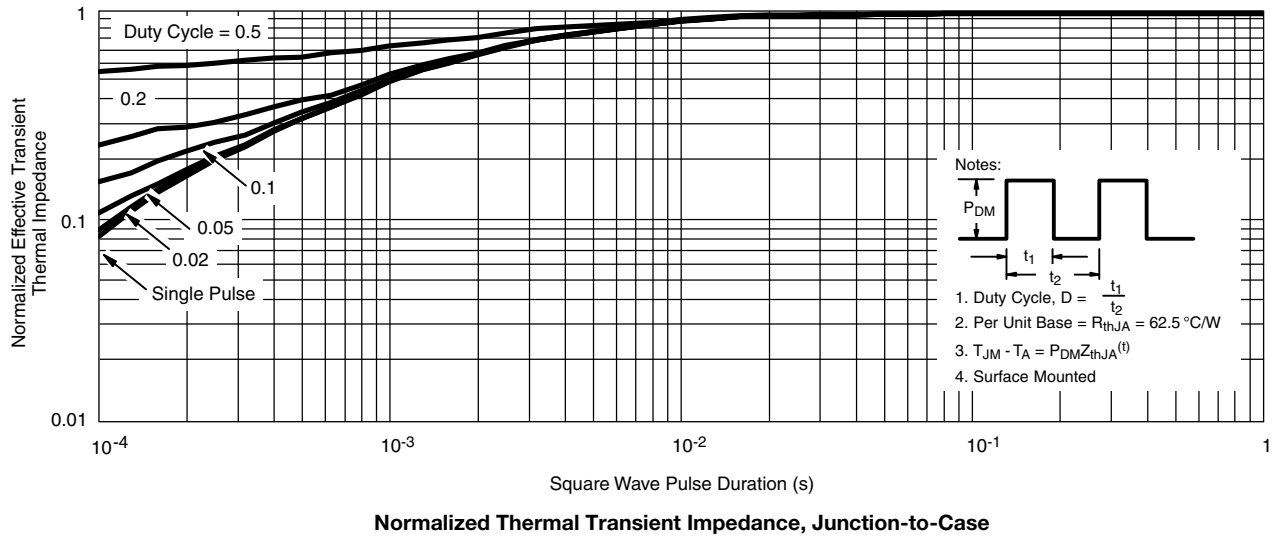


**Source-Drain Diode Forward Voltage**

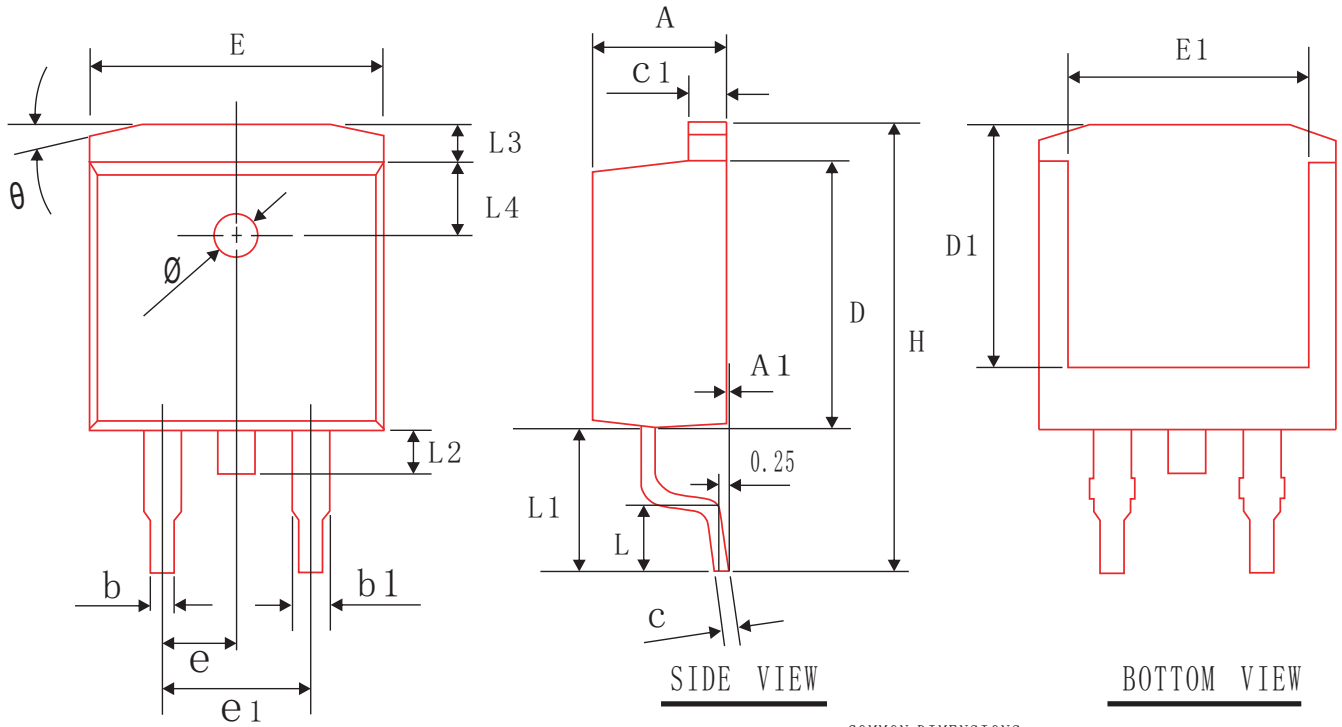


**Safe Operating Area**

**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)

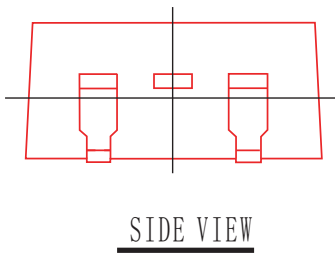


### TO-263A Package Outline



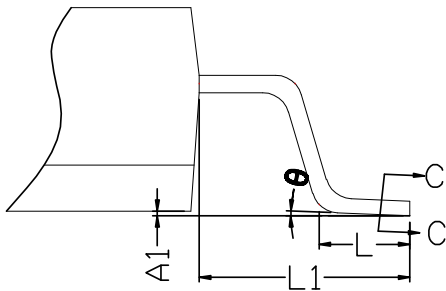
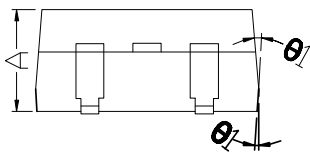
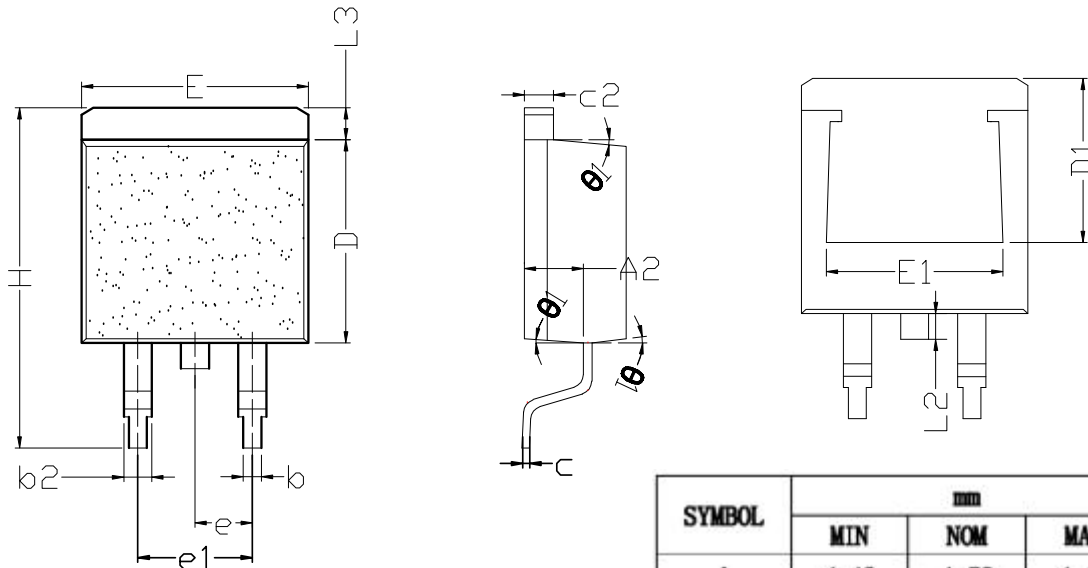
COMMON DIMENSIONS  
(UNITS OF MEASURE=mm)

SYMBOL	MIN	NOM	MAX
A	4.30	4.50	4.70
A1	0.00	NA	0.25
b	0.70	0.80	0.90
b1	1.20	1.30	1.40
c	0.40	0.47	0.55
C1	1.25	1.30	1.35
D	9.00	9.10	9.20
D1	8.00	8.10	8.20
H	14.9	15.2	15.5
E	9.80	10.0	10.2
E1	7.85	8.00	8.15
e1	4.93	5.08	5.23
L	2.00	2.20	2.45
L1	4.60	4.80	5.00
L2	1.30	1.50	1.70
L3	1.15	1.25	1.35
L4	2.40	2.50	2.60
$\emptyset$	1.5 REF		
e	2.54 BSC		
$\theta$	13° TYP		

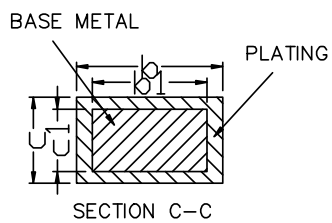


SIDE VIEW

### TO-263B Package Outline



2 : 1



SYMBOL	mm		
	MIN	NOM	MAX
A	4.42	4.52	4.62
A1	0.00	0.10	0.20
A2	2.55	2.60	2.68
b	0.78	0.81	0.84
b1	0.77	0.80	0.83
b2	1.25	1.28	1.35
c	0.36	0.39	0.42
c1	0.35	0.38	0.40
c2	1.25	1.27	1.29
D	8.95	9.02	9.14
D1	7.25REF		
E	9.92	10.07	10.22
E1	7.85REF		
e	2.54REF		
e1	5.08REF		
H	15.00	15.10	15.20
L	2.10	2.23	2.36
L1	4.55	4.65	4.75
L2	1.10	1.30	1.50
L3	1.12	1.28	1.42
$\theta$	0°	2°	5°
$\theta_1$	3°	5°	7°

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